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**A REPORT ON**  
**VERIFICATION OF THE USE OF CBW AGENTS**

**A CRITICAL REVIEW OF THE SITUATION**  
**AS SEEN IN MARCH 1984**

**TO**

**THE ARMS CONTROL AND DISARMAMENT DIVISION**  
**DEPARTMENT OF EXTERNAL AFFAIRS**  
**OTTAWA, CANADA**

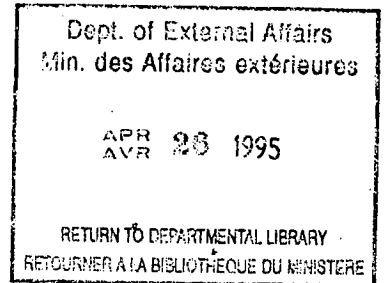
**BY**

**AN AD HOC CRITICAL REVIEW COMMITTEE**  
**R. GREENHALGH, G.R. HUMPHREYS**  
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**W.T. OLIVER AND H.B. SCHIEFER**

**MARCH 1984**

VERIFICATION  
OF THE  
USE OF CBW AGENTS

A  
Critical Review of the Situation  
as seen in February 1984



by  
R. Greenhalgh, G.R. Humphreys,  
D.M. Jarzen, G.A. Neish,  
W.T. Oliver and H.B. Schiefer

(Written by H.B. Schiefer on the basis  
of some written and some verbal comments,  
February 22, 1984)

43-271-927

## 1.0 Introduction

"There are no international procedures within the framework of the United Nations and in accordance with it's charter to investigate allegations of the use of CB weapons"<sup>1)</sup>, and yet, the public debate appears to be demanding a quasi-judicial procedure in which the perpetrator(s) and the weapons used are clearly identified.

Acknowledging the fact that there are no internationally recognized procedures, one could turn to the procedures in use in forensic cases. Under criminal law, an accusation has to be proven **beyond reasonable doubt**, whereas under civil law, it is only necessary to show that, **on the balance of probabilities**, damage was sustained by the action (e.g., damage to health or environment, or whatever is claimed).

While it would be rather helpful to be able to prove beyond reasonable doubt that CBW agents were used, this appears to be next to impossible under the circumstances of events either taking place in an inaccessible place, or where events are reported to have occurred earlier and samples are produced which are supposed to originate from the site of an attack.

It appears to be more prudent to apply the procedures of civil law, i.e., to collect as much evidence and as much information as possible, weigh the evidence (pro and con), to arrive at a situation where, on the balance of probabilities, there is a causative relationship.

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<sup>1)</sup> Ezz, E.A. Carleton Symposium, June 1983.

Whether the public, or any international body, would accept "on the balance of probabilities" as sufficient evidence may be open for debate, but non-believers will doubt anyway, even on the basis of "beyond reasonable doubt".

## 2.0 The Situation in Late 1983

Little progress has been made with respect to proving the allegations that mycotoxins have been used in Southeast Asia, and it is fair to state that those who doubt have actually gained ground by pointing to inconsistencies, non-explained details and simply by using scepticism all the way around.

It is highly unlikely, although not completely impossible, to expect that there will be access to acute events, where one would be able to apply the ideal set of procedures as outlined by Gen. Ezz at the Carleton Symposium in 1983. On the contrary, the situation in 1983 is characterized best by somewhat desperate flood victims who cannot do much about the cause and earlier protective measures of the flood, but try to do their best to protect their property from further damage.

Thus, while it is certainly applaudable to consider first humanitarian aspects (i.e., methods of diagnosis and treatment of victims) or to apply sophisticated methods of examination

of patients<sup>1)</sup> and scrutiny of medical records, or to collect specimens from very recent attacks in a proper manner<sup>2)</sup>, this is - under all likelihood - not the situation we are faced with in late 1983 or early 1984.

### 3.0 Suggestions for Immediate Actions in 1984

3.1 The first step in exploring a relationship between an adverse health outcome and exposure to a CB agent is to look at the frequency with which adverse effects develop in an exposed population in a retrospective study. The most appropriate type of study is the case-control study, where persons with a given health problem are matched in terms of age, sex, and other relevant characteristics to non-diseased (control) persons. Epidemiologists are familiar with the disadvantages of such an approach, and know how to brace themselves against possible criticism. Thus:

It is recommended that further epidemiological data be collected by experienced medical personnel who already know the type of critique likely to be raised.

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- 1) Such as, to determine the route of exposure and entry of the agent (by inhalation? by topical exposure? via the GI-tract? etc.
  - 2) "Proper manner" indicates here: collection and temporary storage using proper methods, sufficient identification and geographic location, with no detail being unattended to; comprehensive observations and recordings of all sorts of details, such as type of plants in bloom, insect and animal behaviour, etc.

3.2 Although an earlier Canadian report<sup>1)</sup> has claimed that there is no indication of natural occurrence of trichothecenes or diseases due to these mycotoxins in Southeast Asia, the critiques say<sup>2)</sup> that we still don't know whether the victims with the symptoms of trichothecene-mycotoxicosis may have or may not have ingested naturally contaminated food.

There are many, rather time-consuming and round-about methods to solve this problem, such as food-basket surveys over one or two years (with particular attention paid to seasons of the year), or search for potentially toxigenic fungal species, or diligent search for trichothecene-related disease in animals, but the only fast way to come to an assessment is the analysis of human body fluids (blood, urine). It is a generally accepted view that humans don't have trichothecenes (or their metabolites) in their body fluids (or organs) unless exposed to these mycotoxins - no matter whether via the diet ("naturally", i.e., because the diet contained, unknowingly, trichothecenes, or "unnaturally", i.e., because they ingested food contaminated from an attack)

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- 1) Schiefer, H.B. Study of the Possible Use of Chemical Warfare Agents in Southeast Asia. A Report to DEA, Canada, June 1982.
  - 2) Meselson's various cautious suggestions to the possibility of natural occurrence of trichothecenes in Southeast Asia, coupled with the enigmatic reports from Thai scientists may serve as example.

or via the skin or the lungs (most likely in the context of a CBW attack, but theoretically also due to exposure to contaminated material in the environment (e.g., fodder for animals, trichothecenes on vegetation, etc.)). Therefore:

It is recommended that blood and urine samples from a number of persons (both from populations which are highly unlikely to have been exposed to CBW attacks and from populations which may have been exposed) be collected and analyzed for the presence/absence of trichothecenes or their metabolites using appropriate and, hopefully, reliable methods.

#### 4.0 Accessory Investigations in 1984

Considering the publicity given to the bee excrement hypothesis, it would be advisable to investigate whether bees, or bee feces, or honey, or bee hives contain trichothecenes. Therefore:

It is recommended that material associated with bees (e.g., feces, honey, hives, or bees themselves) be analyzed for trichothecenes.

#### 5.0 Future Investigations

As it is not known what role, if any, trichothecenes play in Southeast Asia (or, for that matter in many other countries of the world):

It is recommended that Thai scientists be encouraged to conduct surveys as to the natural occurrence of trichothecenes in food, feeds, natural environment, etc., to determine the toxigenic potential of fungi in their country; and to determine the nature of seasonal occurrence of yellow spots, possibly associated with bee excrement, on vegetation.

There is also no doubt that we are still lacking quite a bit of information on the toxicologic characteristics of trichothecenes, including species susceptibility, route of application, dose-response, symptoms and lesions, effects of concomittant diseases, and - above all - reliable methods for detection of trichothecenes.

Most of these aspects have been summarized in the excellent monograph "Protection Against Trichothecene Mycotoxins"<sup>1)</sup>, and it is worthwhile studying this report in detail.

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1) Committee on Protection Against Mycotoxins. National Academy Press, pp. 227, Washington, D.C. 1983.



A CHECKLIST OF THINGS TO BE DONE  
BY THE DEPARTMENT OF EXTERNAL AFFAIRS

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1. Arrange for swift processing of visa for person going to Thailand.
2. Inform Bangkok Embassy by Telex that visit and collection is on and that people listed under 2.0 should be contacted/ called together for a meeting to ensure that they all cooperate, and that exact date of travel and arrival in Bangkok will be communicated by Telex.
3. Send (by courier) a copy of the complete standard operating procedures, and ask them to make the necessary number of copies of the overview table ("TO 1.0").
4. Decide (either in Ottawa or BKK) who should be present (see 3.1) at the time of collection.
5. Inform BKK to provide for sufficient storage space in a refrigerator for samples collected (see 3.2).
6. Ask BKK to provide for sufficient quantities of dry ice for first leg of shipment back to Canada.
7. Inform BKK that standard forms for donor information will be brought along. They don't have to worry about that.
8. Tell BKK that itinerary (see 4.0) is just a suggestion - they can do with it what they want, and rearrange it any way they think is best.
9. Inform someone (is there a Canadian High Commission?) in Hong Kong to have dry ice available (see 5.2) at the airport.
10. Inform Canada Agriculture at customs in Vancouver of the arrival of the shipment (see 5.3), so that there is no fuss about the import of biological materials, and
11. Inform someone (I don't know what to suggest - could the Agriculture Canada Lab in Vancouver do this?) that dry ice is needed again in Vancouver to refill the boxes prior to transport to Ottawa.

**STANDARD OPERATING PROCEDURES**

1. Objective: To collect blood and urine samples from the following groups:

Group I: Patients from a hospital in Bangkok, e.g., Siriraj Hospital or other. This group would be representative of a population that suffers from a variety of diseases, but is ingesting - by and large - the same food, presumably unspoiled.

Group II: Civilians or soldiers from a location as close as possible to the western border (Burma) of Thailand. This group would serve as an example of a rural population ingesting local food, but these people are far removed from any reported "yellow rain" incidents.

Group III: Civilians or soldiers from a location as close as possible to the Kampuchean border. This group serves as an example of a rural population (like Group II), but there might have been a chance of accidental "yellow rain" drift.

Group IV: Same as Group II, but from the Laotian border area.

Group V: Residents of a refugee camp close to Kampuchea. Residents should be questioned and should not have been exposed to a "yellow rain" attack. This group would serve as being representative of refugee camp food, which may or may not be contaminated with trichothecenes.

Group VI: Residents of a refugee camp close to the Laotian border. Other aspects as Group V.

Group VII: As many samples as possible from persons claiming to have been subjected to "yellow rain" attacks in one form or another in the last six months.

The "overview" on the next page summarizes this description. This page could be copied and handed to all collaborators in Thailand, so that they understand what is to be done.

To 1.0

## OVERVIEW OF SAMPLES TO BE TAKEN

<p><u>Group I:</u> Patients from a hospital in Bangkok (Siriraj, Navy Medical Centre or whatever is convenient) 50 samples</p>	<p><u>Group II:</u> Civilians or soldiers (healthy) as close as possible to Burmese (western) border 50 samples</p>
<p><u>Group III:</u> Civilians or soldiers (healthy) as close as possible to Kampuchean border 50 samples</p>	<p><u>Group IV:</u> Civilians or soldiers (healthy) as close as possible to Laotian border 50 samples</p>
<p><u>Group V:</u> Residents of a refugee camp close to Kampuchea, not having had any exposure to yellow rain 50 samples</p>	<p><u>Group VI:</u> Residents of a refugee camp close to Laos, not having had any exposure to yellow rain 50 samples</p>
<p><u>Group VII:</u> Persons claiming to have been subjected to yellow rain attacks in one form or another, in the last three to six months.</p>	

Thailand 1984

2.0 Thai Military Personnel (key people) to be involved in order to set up the collection

1. Cpt. Chalernsuk Yugala, Chem. Dept., RTA.
2. AFRIMS - no names given, could be many people.
3. Col. Pol Premsmit, Chief of Operations and Intelligence, Royal Thai Army - Medical Dept.
4. Dr. Pornthap Kukhanenya, Dept. Preventive Medicine, Royal Thai Airforce, Don Muang, Bangkok.
5. Cpt. Phanlert Dhimkracharng, Royal Thai Navy Hospital.

It is suggested to call these people together well in advance of the actual date of collection of samples.

3.0 Standard Procedure for Collection of Samples

3.1 Persons present (besides donors)

1. Thai medical officer or person taking the blood samples.
2. A representative of Canada (from Embassy or other persons from Canada).
3. A representative of the U.S. (Dr. Townsend?)
4. A representative of France (optional).
5. An interpreter (if needed) for refugees.

3.2 Method of collection

1. Blood is to be collected in heparinized "vacutainers" (300 tubes are already at the CDN Embassy in Bangkok).
2. Urine is to be collected in leak-proof containers, which have been prepared with a suitable agent to ensure that biodegradation doesn't take place.
3. From each donor, some basic information has to be obtained, using a standard form (for Group I to VI, or the special form (for Group VII). (See appended samples which have to be printed in advance.)
4. Samples are to be identified by consecutive numbers, corresponding to the list of name, sex, age, general health status, and time and location of sampling, using water-proof marker.
5. Samples are to be placed into temporary refrigeration (ice box, etc.) for transport to Bangkok, then kept in refrigeration until shipment. A suitable place (large refrigerator) should be designated and arranged for in advance.
6. Five spiked (control) samples containing 100 and 200 ppb of T-2 toxin or any other suitable trichothecene, and 5 non-spiked control samples will be added prior to shipment.

Standard Form to be used for each donor

Base-Line Study (Thailand) (Groups I to VI)

Name	Sample #
Birthdate or Age	Sex: Male (circle) Female
Residence (address or the like)	
<u>General Health Information</u> General appearance	
Any health problems encountered in last 12 months: Yes/No If yes, what type of problems?	
Any hospital stay in last 12 months.: Yes/No If yes, for what reason?	
Any other comments?	
Date:	Name/Signature

Special Form to be used for refugees/  
persons claiming to have been subjected  
to "yellow rain" attacks

Base-Line Study (Thailand) Group VII

1. Name	Sample #
2. Birthdate or age	3. Sex: Male Female
4. Residence (address or the like)	
<u>General Health Information</u>	
5. General appearance	
6. Any health problems encountered in last 12 months? Yes/No If yes: What type of problems (use reverse side for recording)	
7. Any hospital stay in last 12 months? Yes/No If yes, for what reason (use reverse side for recording)	
<u>Questions on CBW attacks</u>	
8. When did you encounter a "yellow rain" or other chemical attack?	
9. Where was this (location)?	
10. What happened? Type of attack? Type of symptoms encountered? Any casualties (use reverse side for recording)	
Date:	Name/Signature

4.0 Draft of an Itinerary (days in Thailand only)

Days 1 & 2: Preparatory discussions; collection of samples in Bangkok (Group I).

Day 3: Collection of samples close to Burmese border (Group II).

Day 4: Bangkok.

Days 5 & 6: Collection of samples close to Kampuchean border (Groups III, V and possibly VII).

Day 7: Bangkok.

Days 8, 9, 10: Collection of samples close to Laotian border (Groups IV, VI and possibly VII).

Days 11 & 12: Bangkok (preparation of shipment).

Note: Any other sequence is acceptable as well; the sequence has to be determined on the basis of availability of personnel.



5.0 Transport to Canada

- 5.1 For transport to Canada, large styrofoam boxes have to be prepared. The boxes with the vacutainers are placed into the centre, surrounded by thin insulation (styrofoam) all the way around. The remaining space is filled with dry ice (to be arranged for in advance).
- 5.2 The first part of the shipment will be from Bangkok to Hong Kong, where the dry ice has to be refilled. This requires notification of someone in Hong Kong to supply the dry ice.
- 5.3 In Vancouver, prior arrangements will have to be made with Customs and Agriculture Canada officials to allow for swift onward transportation to Ottawa. The dry ice has to be refilled once again in Vancouver. This requires, again, notification of someone.
- 5.4 For the flight from Vancouver to Ottawa, no special treatment except "Handle with Care - Glass/Breakable" is necessary.
- 5.5 A person will have to meet the shipment and arrange for the transport from Ottawa airport to the laboratory and ensure further proper storage.

6.0 Laboratory Analysis

- 6.1 Most samples will be analyzed in Dr. Greenhalgh's laboratory.
- 6.2 Some samples may be split and analyzed in other laboratories.
- 6.3 Methods for analysis will be described in an appendix at a later date.



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Thirty-ninth session  
Item 64 of the preliminary list\*

CHEMICAL AND BACTERIOLOGICAL (BIOLOGICAL) WEAPONS

Note verbale dated 21 February 1984 from the Permanent Representative  
of the United States of America to the United Nations addressed to  
the Secretary-General

The Permanent Representative of the United States of America presents her compliments to the Secretary-General of the United Nations and has the honour to provide further information pertaining to the use of chemical and toxin weapons in the continuing conflicts in Afghanistan, Kampuchea and Laos. The United States is sharing its new preliminary findings for 1983 in accordance with its policy of keeping the international community and the public routinely informed in a timely manner about chemical and toxin weapons use in these areas. In view of the concerns of Members of the United Nations, as expressed in General Assembly resolutions 35/144 C of 12 December 1980, 36/96 C of 9 December 1981, 37/98 D and E of 13 December 1982 and 38/187 C of 20 December 1983, the Permanent Representative requests that this submission be circulated at an early date as an official document of the General Assembly under item 64 of the preliminary list.

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\* A/39/50.

ANNEX

United States submission to the Secretary-General of  
the United Nations on the use of chemical and toxin  
weapons in Afghanistan and South-East Asia

The United States of America has long been concerned about the use of chemical and toxin weapons in Afghanistan and Southeast Asia, in violation of the Geneva Protocol of 1925, related rules of customary international law, and the 1972 Biological and Toxin Weapons Convention. The United States has thus carefully monitored the situation in these regions to obtain information about chemical and toxin weapon attacks and has shared the information and evidence with the United Nations and its Member States. The United States has also cooperated fully with the Secretary-General and his Group of Experts in the United Nations' investigation of this problem and in other international efforts to bring a halt to the use of these terrifying weapons.

The United States of America, over the past three years has submitted a series of reports presenting the evidence of toxic weapons use and relevant technical information in detail entitled "Chemical Warfare in Southeast Asia and Afghanistan", dated 22 March 1982 (A/37/157), and "Chemical Warfare in Southeast Asia and Afghanistan: An Update," dated 29 November 1982 (A/C.1/37/10). Most recently, on 4 August 1983, the United States submitted a report (A/38/326) on evidence obtained from victims of toxic warfare attacks which had occurred earlier in Laos and Kampuchea.

Since the submission of the last report, the United States has continued to analyze and review the information and evidence available to it on the use of chemical and toxin weapons in Afghanistan and Southeast Asia. As with the previous submissions, the United States has considered reports of toxic attacks as valid only if they were confirmed from two or more types of sources. These kinds of sources include national technical means, intelligence means, medical and sample data, and direct evidence from a person, other than a victim or refugee, known to have access to a particular attack site. Therefore, while we never discount per se any report or second hand information, our evidence must satisfy those tests of consistency and multiple sources to be considered valid before it is included in our final body of data.

4/6

Toxic weapons attacks, deaths and incapacitation continue to be reported. At this point in our analysis, however, the 1983 information shows some differences from that of previous years. Specifically, there appears to have been a diminution of attacks in Afghanistan, and a decrease in the lethality of attacks in Laos and Kampuchea. At the same time, however, there is evidence of continuing use in Laos and Kampuchea of an as yet unidentified, non-lethal agent or agents.

Since December 1980, the international community, the United Nations and private individuals and organizations have been calling attention to chemical and toxin weapons use and bringing substantial international pressure to bear on the users to cease such activities. Although current evidence indicates a decrease in the use of toxic weapons, the international community must persevere in its efforts to bring about a full and permanent cessation. Permanently ending the use of these weapons in Afghanistan and Southeast Asia, however, is only one of our goals. In addition, the Government of the United States will continue to press for strengthening relevant international conventions and for achieving a complete and verifiable ban on all chemical weapons through the Conference on Disarmament in Geneva.

Secretary of State Shultz expressed the concerns of the United States in his letter of submission for our November 1982 report:

"The use of chemical and toxin weapons must be stopped. Respect for existing agreements must be restored and the agreements themselves strengthened. Failure to achieve these goals can only have serious implications for the security of the world community, particularly for the security of smaller nations, like those whose people are being attacked."

Accordingly, the United States will continue to monitor the situation and share with the United Nations what further relevant information it may acquire on prohibited use of toxic weapons. In this connection, the United States will not neglect to monitor other areas in the world where prohibited use of chemical weapons has been alleged. The United States notes with deep concern reports that chemical weapons have been used in the unfortunate ongoing conflict between Iraq and Iran -- both parties to the 1925 Geneva Protocol. Such use of chemical weapons would constitute yet another serious breach of the Protocol, and related rules of customary international law, requiring the urgent attention of the world community.

/...

5/6

Afghanistan: The United States has received several reports of Soviet chemical attacks occurring in 1983 but, contrary to previous years, we have not yet been able to confirm these reports as valid, in accordance with our above mentioned standards. For 1982, on the other hand, the United States had strong evidence of several dozen chemical attacks in Afghanistan, resulting in over 300 agent-related deaths.

Laos: The number of reported toxic attacks in 1983 on which the United States has data is roughly the same as in previous years. While our analysis of these reports has not been completed, our preliminary judgement is that use of toxic agents has actually declined in 1983. Additionally, the number of agent-related deaths and cases of illness resulting from these 1983 attacks appears to be approximately one-third that for 1982. Some deaths associated with toxic attacks occurring in 1983 resulted from secondary effects, such as from eating contaminated animal products after an attack. In some cases, deaths occurred only among the infirm, perhaps caused by exposure to normally non-lethal agents or lethal agents in low concentrations. Additionally, descriptions of the 1983 incidents and medical effects, by victims, doctors and eyewitnesses differ from those of previous years. Fewer describe the rapid onset of nausea and vomiting, small blisters; severe irritation of the skin, severe bleeding syndromes, including protracted diarrhea; or vomiting of blood which were common in reports from earlier years. These symptoms, in the past, were associated with exposure to trichothecene toxins, as confirmed by sample analysis and examination of victims by doctors. Methods of delivery of the agents, however, were as reported in previous submissions, with aerial spray occurring most often.

Kampuchea: The number of reports of toxic attacks in 1983 is close to fifty percent greater than the number in 1982. Based on analysis of these reports to date, however, it appears that the level of use of toxic weapons has not increased, but remained essentially the same as in 1982. We believe that the increase in reports is due in part to better monitoring of the occurred. The number of agent-related deaths resulting from attacks in 1983 also appears to have decreased significantly from 1982 levels. On the other hand, victims did experience more short-term, incapacitating effects from which they recovered in hours or days. This may be indicative of the use of non-lethal incapacitating or riot control agents. As with Laos, 1983 reports for Kampuchea contain far fewer descriptions of trichothecene toxin type effects than reports from 1982 and earlier years. Methods of delivery of the agents were as previously reported.

6/6

General Note: With regard to environmental and physical samples from Afghanistan, Laos and Kampuchea, the United States has received and analyzed in 1983 one biological sample which was confirmed positive for trichothecene toxins. This was a sample from a March 1983 attack in Kampuchea, reported in the August 4, 1983 U.S. submission. Confirmatory analysis for trichothecene toxins is pending on several other biological samples from early 1983 reported toxic attacks. The United States also has a number of 1983 samples under analysis which contain man-made toxic chemicals and assorted substances other than trichothecene toxins and known conventional chemical agents. The precise composition of these substances has not yet been fully characterized. In keeping with our past practice, the United States will report its results and conclusions when these analyses are completed. Similarly, the United States will report any changes in our overall judgments and findings for 1983 as analysis of the data further progresses.

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FEB 22 1984

# U.S. Finds No New Proof of Soviet Chemical War

By PHILIP M. BOFFEY  
Special to The New York Times

WASHINGTON, Feb. 21 — A State Department report presented to the United Nations today said that there was no confirmed use of chemical weapons in Afghanistan last year and that the deadliness of chemical warfare attacks in Laos and Cambodia had diminished substantially.

The four-page document also revealed that no sample of environmental or physical material analysed in 1983 was found to contain trichothecene mycotoxins, the kind of poison that the United States had accused the Soviet

Union of spraying in previous years. Such toxic sprays have been called "yellow rain" by Southeast Asian tribesmen who contend that people have become sick or died after exposure to the yellowish substance.

The report, titled "New Preliminary Findings for 1983," reiterated that only one of the human biological samples tested — blood collected in Laos from a Cambodian woman who said she had passed through an area attacked by chemicals — was found to contain trichothecene mycotoxins, as previously stated in August.

A Government official active in yel-

low rain reviews said the tests last year, through mid-November, covered 47 environmental and physical samples from Laos, 22 from Cambodia, and 8 from Afghanistan. None contained trichothecene mycotoxins.

There were also 36 sets of human biological samples, mostly blood and urine, from Cambodia, 29 sets from Laos, and none from Afghanistan.

The latest findings were taken by one critic as evidence that the United States may have erred in its original charges that the Soviet Union and its allies were using chemical weapons.

"The document strikes me as a retreat," said Dr. Matthew S. Meselson, a Harvard molecular biologist. "I hope it is now being realized in the Government that the evidence for any kind of chemical warfare in Southeast Asia is crumbling away."

The United States Government contends that intelligence intercepts and reports from refugees, defectors and relief workers indicate that chemical agents are being used, while laboratory tests demonstrate that trichothecenes mycotoxins have been used.

The official involved in yellow rain issues said the original charges were still supported by evidence. He said a possible reason for the diminution in the use of chemical weapons may have been a change in military tactics or the abandonment of chemical warfare under the pressure of charges from the United States.

However, the academic critics, of whom Dr. Meselson is the most prominent, assert that the Government's case is weak. They contend that the "yellow spots" examined so far are nothing but the excrement of bees, which contains yellowish pollen. They also suggest that the trichothecene toxins found in environmental samples and in the blood of some alleged victims were produced naturally by fungi and then contaminated both the bee feces and the food eaten by people who show toxins in their blood.

"I am certain now that the yellow rain samples handled are in fact bee droppings," Dr. Meselson said today. "And I strongly suspect that the trichothecenes are of natural occurrence."

The document issued today said that reports of chemical attacks in Afghanistan had dropped from "several dozen" in 1982, resulting in more than 300 deaths, to "several" in 1983, none of which could be confirmed as valid from two or more types of sources.

In Laos, the document said, the use of toxic agents declined in 1983 and the deaths and illness they caused was one-third the 1982 level. In Cambodia, the use of toxins remained the same as in 1982 but the number of deaths that resulted "decreased significantly."

The report suggests that an unidentified nonlethal chemical agent or agents are being used in Laos and Cambodia.

It also "notes with deep concern re-

# Education

## Happy Fellows, Family Feud

*The MacArthur Foundation's largesse and legal problems*

Harvard Biologist Matthew Meselson, 53, has been embroiled in bitter controversy ever since he suggested last spring that the "yellow rain" in Southeast Asia, which the State Department claims is biochemical weaponry used by the Soviet Union, is actually bee droppings. Last week, as the beleaguered Meselson sat dictating letters requesting \$700 from the Harvard administration to help fund his work, the phone rang. An official of the John D. and Catherine T. MacArthur Foundation in Chicago informed him that he had been chosen to receive a five-year, no-strings \$256,000 award. Meselson covered the mouthpiece and gleefully exclaimed to his secretary: "Money!"

Money, indeed. The award was one of 22 announced last week, ranging from \$128,000 to \$300,000. Since 1981 the MacArthur Foundation—a \$1 billion fund established by an insurance tycoon—has bestowed such largesse on scholars and artists to give them creative freedom. The current list of winners indicates that the foundation has responded to criticisms of its past selections: that they have been too male, too white and too academic. The new fellows include four women (one of them black) and seven non-academics, among them two visual artists, a Hispanic community organizer, an ornithologist and a Catholic priest.

They also include the youngest MacArthur winner ever: David Stuart, 18, a junior fellow at the Dumbarton Oaks library and museum in Washington, D.C., and an expert in Mayan hieroglyphics. Stuart became fascinated by the "weird carvings" when at the age of nine he accompanied his archaeologist father on a dig in Mexico. Even before graduating last year from Bethesda Chevy-Chase High School in Maryland, he had published scholarly papers

on the subject. The oldest winner is Paul Kristeller, 78, a professor emeritus of philosophy at Columbia University. Ever since he ran out of funding from the National Endowment for the Humanities, in 1980, Kristeller has been working without assistance on a six-volume listing of Renaissance manuscripts. MacArthur's \$300,000 grant, he says, will "improve my chance of continuing and possibly com-



Kristeller



Stuart with pre-Columbian hieroglyphics  
*Five years of creative freedom.*

pleting this project before it is too late."

"I am very happy with the selections," commented Roderick MacArthur, 63, a board member and son of the founder. He was not so happy, however, with his foundation colleagues. The same day the awards were announced, MacArthur filed suit against the president and seven directors, accusing them of mismanagement of assets, conflicts of interest and excessive fee taking (all unrelated to the foundation awards). In a countermotion, the foundation charged that John D. MacArthur had held Roderick in low regard, and produced a 1975 letter from father to son that said, "Most of your life has been wasted. You were born with a good intellect but never learned the meaning of teamwork." Despite the legal wrangling, Foundation President John Corbally remained cheerful, remarking last week: "We specialize in philanthropy and litigation." ■



## U.S. condemns Iraq's use of poison gas in war with Iran

The Washington Post

WASHINGTON — The State Department Monday accused Iraq of using internationally outlawed "lethal chemical weapons" against Iranian troops in the war between the Persian Gulf neighbors.

Iran has frequently charged Iraq with using poison gas, and recently U.S. officials have suggested that such claims could be true. But Monday marked the first public accusation against Iraq by the Reagan administration, which, although officially neutral on the war, has tended to be more sympathetic toward Iraq.

Citing "available evidence" against Iraq, the State Department said "the United States strongly condemns the prohibited use of chemical weapons wherever it occurs. There can be no justification for their use by any country."

Privately, some officials were less harsh on the Iraqis. They said the country faced a situation in which it was being attacked by waves of Iranian troops and where any major crack in the Iraqi defenses could bring down the army and the government. Thus, they said, it was not surprising that Iraq would use any weapon in its arsenal.

Intelligence sources said the Iraqis are mostly using mustard gas, an incapacitating and sometimes lethal gas that was employed extensively during the First World War. Its use was later banned under the 1925 Geneva Convention, which Iran and Iraq signed.

The sources said Iraq is producing the poison gas in its own facilities and that there are also indications that the Middle East country has begun limited production of a much more lethal nerve gas.

The informants traced Iraq's involvement with chemical weapons to the 1950s, when Baghdad, using equipment provided by the Soviet Union, sought to develop defenses against chemical warfare. But in the early 1970s, the sources said, Iraq began making mustard gas for offensive weapons, accelerating production in the early 1980s after the war began.

U.S. government sources said Monday that Iraq has three plants producing poisonous gas. One, about 100 kilometres northwest of Baghdad, is the main mustard-gas producer, and also appears to house a new nerve-gas production facility that U.S. specialists say could turn out significant amounts within a year.

U.S. specialists said Iraq used mustard gas against Iranian forces in October and November and again much more recently. They said it appears that most of the gas was fired at the Iranians in artillery and mortar shells, and some of it in bombs. There sometimes was confusion about what gas was being used, they said, because Iraq also occasionally used non-lethal tear gas.

Officials here were unwilling to speculate on the possible effect of the State Department statement Monday, although officials said they would support a UN investigation.

Stephen Salaff  
Toronto, Canada

## CANADA AND "YELLOW RAIN": TIME FOR RE-EVALUATION

### 1. A "Perfect Fit"

The United States government claims that the armed forces of Viet Nam, controlled by the Soviet Union, have been terrorizing the military rebels and civilian populations in Laos and Kampuchea with lethal toxic weapons:

For those directly exposed to this "yellow rain", its effect was quick and dramatic. They would experience an early onset of violent itching, vomiting, dizziness, and distorted vision. Within a short time, they would vomit blood-tinged material, then large quantities of bright red blood. Within an hour, they would die, apparently of shock and the massive loss of blood from the stomach ... These toxins have produced all of the symptoms ... mentioned, and they are not known to produce any symptoms not reported. The fit, in other words, was perfect.<sup>1</sup>

According to Washington, trichothecene toxins, produced by species of fungi with genus name Fusarium,

were found in the urine, blood, and tissues of victims of "yellow rain" attacks in Laos and Kampuchea ... a common factor in the evidence is

Soviet involvement in the use of these weapons ... Our judgement is based both on our newly acquired information and on continued analysis of prior data about Soviet mycotoxin research and development, chemical warfare training in Viet Nam, the presence of Soviet chemical warfare advisers in Laos and Viet Nam, and the presence of the same unusual trichothecene toxins in samples collected from all three countries.<sup>2</sup>

Reports charging more than 10,000 "yellow rain" fatalities in Laos and Kampuchea (formerly Cambodia) were signed by Secretaries of State Alexander Haig in March 1982, and George Shultz in November 1982.<sup>3</sup> The State Department condemns the U.S.S.R. for violating the 1925 Geneva Protocol prohibiting at least the initiatory use of chemical weapons, and the 1972 Convention banning the production, stockpiling and transfer of biological weapons.<sup>4</sup>

The U.S.S.R. categorically denies that it has ever used chemical weapons or transferred them to another country.<sup>5</sup> Viet Nam, Laos, and the

People's Republic of Kampuchea join in these denials.

The Haig Report is based on laboratory analysis of several plant, water and rock samples allegedly collected in 1981 or earlier at chemical attack sites in Laos and Kampuchea. The Shultz Report is keyed to laboratory analyses of blood, urine and tissue specimens taken in 1982 from members of Laotian and Kampuchean military resistance groups and refugees allied to them.

Before publication of the Shultz Report, biochemist James R. Bamberg, the co-discoverer in Wisconsin, 1968, of T-2 toxin, the supposed main toxic ingredient of "yellow rain", and of its derivative HT-2 in 1969, told Congress that "trichothecene-producing fungi have been isolated from virtually every region of the world including warm, tropical areas ... The mixtures of the various trichothecenes found (in State Department "yellow rain" samples), while not produced by pure culture of known fungal isolates, could certainly arise from mixed fermentation occurring naturally".<sup>6</sup> Despite this fact, the Shultz Report claimed<sup>7</sup> that those components of "yellow rain" identified in U.S. laboratories are "unique and unusual":

Experts agree that these people (Hmong mountain migrants of Laos) were exposed to a toxic agent and that no indigenous natu-

ral disease, plant or chemical caused these unique physical effects.

2. Three Canadian Investigations:  
No Evidence of Chemical Warfare

Only one expert is cited by Secretary Shultz: Dr. H. Bruno Schiefer, Professor of Veterinary Pathology and Director of the Toxicology Research Centre at the University of Saskatchewan. Dr. Schiefer writes that "potential producers of trichothecenes do exist in Southeast Asia, but neither naturally occurring diseases due to trichothecenes are described or seen, nor are there any detectable levels of toxins in the environment".<sup>8</sup>

Dr. Schiefer visited two border camps during a fortnight's trip to Thailand in February 1982, where he met fighters of the Khmer Rouge<sup>9</sup> and Vang Pao<sup>10</sup> armies. Dr. Schiefer presents no evidence that these troops were poisoned by chemical weapons. Dr. Schiefer and the two teams of Canadian investigators who followed him to the Thai camps in February-March and in May 1982 are generally supportive of the arguments advanced by the State Department, but none of them saw a "perfect fit" of violent symptoms to clear-cut causes, and none mentions, even in passing, the hypothetical manufacture and dissemi-

nation of mycotoxin weapons by the Soviet Union.

Canada's second dossier, compiled by Dr. G.R. Humphreys of the Department of National Defence,<sup>11</sup> is based on prolific but vague and unconfirmed verbal accounts of Vietnamese chemical warfare attacks in Kampuchea and Laos. Secretary Shultz<sup>12</sup> fastened on Dr. Humphreys' hypothesis that the effects borne and described by troops of the Khmer Rouge army were caused by chemical incapacitating agents<sup>13</sup> as cardinal evidence of toxic attacks in Kampuchea. But Dr. Humphreys does not claim that he detected any chemical agents, and cannot state the composition or mode of delivery of the

purported incapacitants.

A third Canadian paper describes interviews conducted by the Department of External Affairs with four Hmong account givers.<sup>14</sup> Health and Welfare Canada in Ottawa searched for trichothecene toxins in samples of their blood, but failed to discover any.<sup>15</sup>

Table 1 summarizes data on all of the human samples collected by Dr. Schiefer, Dr. Humphreys and the Department of External Affairs. So far as can be discerned from the information released about their analysis in Canadian government laboratories, these specimens are barren of chemical warfare evidence.

Table 1. Canadian Chemical and Biological Warfare Investigations on the Thailand Border, 1982 (Kampuchean and Laotian Interviewees, and Samples Collected)

	Dr. Schiefer	Dr. Humphreys	Department of External Affairs
	February 1982	March 1982	May 1982
<u>Nong Pru:</u>			
interviewees	7 Khmer Rouge troops	15 Khmer Rouge troops of Toul Chrey incident (occurred 13 February 1982)	did not visit
		3 Khmer Rouge troops of Pailin incident (occurred 8 March 1982)	
samples	Cheng Soeur blood and urine	urines of Toul Chrey 15 Chan Mann autopsy specimens	
<u>Ban Vinai:</u>			
interviewees	2 Hmong fighters	13 Hmong refugees	4 Hmong refugees
samples	none	none	5 bloods and urines
Sources:	<u>H.B. Schiefer, Study of the Possible Use of Chemical Warfare Agents in Southeast Asia: A Report to the Department of External Affairs, 1982, circulated as UN Document A/37/308, June 1982;</u> <u>G.R. Humphreys and J. Dow, An Epidemiological Investigation of Alleged CW/BW Incidents in SE Asia (Ottawa: National Defence Headquarters, 1982);</u> <u>Report on Possible Use of Chemical Warfare Agents in Southeast Asia: Refugee Interviews at Ban Vinai, 5 May 1982 (Ottawa: Department of External Affairs, 1982).</u>		

3. Nong Pru: Khmer Rouge Informants

On his sojourn in Thai border areas during February 1982, conducted at the request of the Department of External Affairs, Dr. Schiefer stopped

for one day at the Khmer Rouge facility close to Nong Pru.<sup>16</sup> Dr. Schiefer interviewed seven hospitalized army men, who told him that gas was fired at them by 105 mm shells, in an encounter near the camp six days earlier. Dr. Schiefer did not obtain medical evi-

dence that the Khmer Rouge soldiers were poisoned, and six of them were on their way to recovery.<sup>17</sup> He was given samples of the blood and urine of the seventh man, named Cheng Soeur, a victim of falciparum malaria, the most serious type of this disease. Dr. Schiefer forwarded these samples to the Defence Research Establishment at Suffield, the principal laboratory in Canada for research on chemical, biological and nuclear warfare. "An initial analysis for traditional CW (chemical warfare) agents was carried out at DRES in Suffield. Nothing unusual has been found. These samples are waiting for further analysis for mycotoxin metabolites".<sup>18</sup> This "further analysis" has not been released.<sup>19</sup>

A United Nations Experts Group of Third World scientists visited Thailand in 1981-1982 to investigate U.S. accusations of chemical warfare.<sup>20</sup> The Experts Group asked Khmer Rouge leaders at Nong Pru to furnish tangible evidence of chemical attacks. Despite the fact that the sites of these alleged attacks are all within a few kilometers of Khmer Rouge entrenchments along the porous Thai-Kampuchean border, the Group received "neither remnants of delivery systems nor samples of the alleged chemical agents".<sup>21</sup> None of the Khmer Rouge cadres interviewed by Dr. Schiefer and Dr. Humphreys provided them with artillery ordnance pieces or their unburned contents, or

any other chemically contaminated military equipment.

Fifteen soldiers at the Nong Pru centre told Dr. Humphreys in early March 1982 that they were bombarded by Vietnamese artillery on 13 February 1982, in a battle near the village of Toul Chrey, 30 kilometers south of Nong Pru.<sup>22</sup> Dr. Humphreys surmised from their symptoms (including dryness of the mouth, tearing of the eyes, burning in the nose, rapid heart rate, drunk-like behaviour, and "collapse to the ground") that the Vietnamese artillery hit the soldiers with an unknown, but not necessarily mycotoxin-related "knockout gas" or non-lethal incapacitating agent.<sup>23</sup> Camp hospital staff gave urine samples from the 15 Toul Chrey casualties and four controls to Dr. Humphreys on 6 March 1982. He submitted them to the Department of National Defence in Ottawa for laboratory analysis. Dr. Humphreys does not know the results of this analysis. Information on whether or not they were screened for mycotoxins is confidential and classified.<sup>24</sup>

Dr. Humphreys reviewed the field medical cards of five Toul Chrey victims, and learned that Khmer Rouge medics administered atropine to combatants when they arrived at the Nong Pru hospital.<sup>25</sup> One Toul Chrey casualty, for example, was treated with 2.5 milligrams of atropine intra-

venously for each of the first two days of hospitalization.

In the case of nerve agent poisoning, current Canadian Forces doctrine, which is concordant with the chemical-biological warfare policy of the North Atlantic Treaty Organization (NATO), calls for immediate intravascular injection of 2 milligrams of atropine. But

atropine would not be used if an incapacitating agent were utilized against NATO forces ... atropine is not the recommended therapy for the treatment of an incapacitating agent (and) may cause an individual to experience dryness of the mouth, flushing, bradycardia (slowing of heartbeat), mydriases (widening of the pupils), blurred vision and urinary retention.<sup>26</sup>

Dr. Humphreys notes that the large doses of atropine administered by the Khmer Rouge to the Toul Chrey casualties, on the faulty assumption that they were attacked by nerve gas, may have caused the variety of incapacitating effects he lists, without providing any therapeutic benefits.<sup>27</sup>

Chan Mann, named by Dr. Humphreys as a sixteenth survivor of the Toul Chrey incident, died on 16 March 1982 after brief hospitalization at Nong Pru. Dr. Humphreys reports that at autopsy, the hospital surgeon removed sections of the heart, lung, kidney, stomach and intestine.<sup>28</sup> Dr. Humphreys assisted the surgeon to dissect these organs and divide them between the Humphreys team and one

from the U.S. Embassy in Bangkok. The Humphreys Report does not mention that the liver was removed, and Dr. Humphreys does not recall dissecting this organ or seeing it among the autopsy materials.<sup>29</sup> The origins of the six grams or more of Chan Mann liver tissue which the State Department submitted for analysis to a Texas A & M laboratory are therefore puzzling.<sup>30</sup>

The National Defence Medical Centre analyzed the Humphreys samples in Ottawa, and attributed Chan Mann's death to acute renal (kidney) failure with terminal lung edema (waterlogging), probably due to shock brought on by the renal failure.<sup>31</sup> The simultaneous presence of these phenomena could be caused by blackwater fever, a complication of falciparum malaria. This disease, notes Dr. Humphreys, can produce a sudden onset of high fever, vomiting, jaundice and renal failure:

Although the pathological examination failed to provide evidence of acute malaria in the tissue samples, analytical diagnoses provide evidence which make it impossible to exclude blackwater fever as a possible cause of the death.<sup>32</sup>

The U.S. samples of Chan Mann organs were analyzed by Prof. Mirocha of the University of Minnesota and Prof. Rosen of Rutgers University, who detected T-2, HT-2 and DAS trichothecene toxins in the intestine, stomach, kidney and lung. Animal

studies have demonstrated that T-2 toxin is rapidly metabolized within the body to HT-2 toxin and other derivatives<sup>33</sup>, so it is anomalous that more than 31 days after Chan Mann was allegedly exposed to chemical attack, the levels of T-2 toxin found in his tissues were greater than those of HT-2 toxin.

Large amounts of aflatoxin, a naturally-occurring food contaminant, were discovered in the intestine, stomach, kidney and liver of Chan Mann by Dr. Timothy D. Phillips of Texas A & M University.<sup>34</sup> The Shultz Report exhibits the Chan Mann post-mortem as strong evidence for "yellow rain" poisoning in Kampuchea,<sup>35</sup> but does not mention either the toxic effects of atropine overdosing, or the acute malaria prevalent at Nong Pru. Dr. Phillips has revealed a third danger to the life of Chan Mann, independent of enemy chemical agents: his food may have been contaminated by naturally-occurring aflatoxins.

#### 4. Ban Vinai: The Vang Pao Hmong

Nearly all of the Laotian "yellow rain" testimonies originate in one refugee camp in Thailand named Ban Vinai, which is used by Vang Pao adjutants as a political-military resistance base for incursions back into Laos. No chemical warfare accounts are recorded at Ban

Nam Yao, a camp for Hmong and other Laotian refugees in northern Thailand, which is not controlled by Vang Pao clans. The Vang Pao Hmong claim that the "yellow rain" assaults mainly occur in the region around Phu Bia, the highest mountain in Laos, located 125 kilometers northeast of Vientiane. The Haig Report tallies 200 "chemical attacks" in the Phu Bia area, among 226 alleged incidents in all of Laos between 1975-1981.<sup>36</sup>

During his two-day visit to Ban Vinai, Dr. Schiefer heard the "yellow rain" testimonies of two Vang Pao fighters, and collected transcripts of earlier interviews with them and other Hmong expatriates at the camp. The essential item in these reports was the alleged aerial spraying on up to 18 occasions of chemical poisons on one village. Dr. Schiefer noticed skin lesions on the arms and legs of one of his informants, but could not determine the cause of these scars.<sup>37</sup> Neither he nor any other interviewers could corroborate the village poisoning accounts with physical evidence.

Thirteen new arrivals at Ban Vinai told Dr. Humphreys that a biplane had sprayed white smoke on their village on 25 November 1981, causing 25 deaths. Their afflictions, including eye, ear, nose and throat disorders and gastrointestinal disturbances,

do not fit the descriptions of mycotoxin poisoning initially circu-



lated by the U.S. There were no reports of projectile vomiting, immediate onset of symptoms and immediate death ... The spectacular effects described by the U.S. in its public presentations are not supported by the Hmong.<sup>38</sup>

Dr. Schiefer joins this challenge to Washington's "perfect fit" conjecture:

Not consistent with the assumption of T-2 toxin and similar trichothecenes as principal causative agents are the reports of immediate death after spraying of "yellow rain". This group of trichothecenes will not cause immediate death unless one would assume that a vehicle, like DMSO (Dimethyl sulfoxide, a strong solvent) was used to facilitate the entrance of trichothecenes into the body. As of the day of writing of this evaluation (June 1982) there have been no reports of finding DMSO in any of the samples of alleged chemical warfare attacks.<sup>39</sup>

At Ban Vinai in May 1982, a Canadian immigration officer interviewed four emigres from Hmong villages in a river valley 25 kilometers southwest of Pru Bia mountain, who "claimed to have heard, but not seen a jet aircraft fly over their villages. They then observed a wet, yellow sticky substance fall to the ground where it formed into small beads. Several witnesses were actually hit by the substance. The witnesses claimed that a total of approximately eighty persons died in their villages, although the maximum seen by any one witness was sixteen deaths".<sup>40</sup> Three of the four men independently asserted to the Canadian official that they per-

sonally saw sixteen people die in their own village.<sup>41</sup>

Nevertheless, when the United Nations Experts Group found three of the four Canadian respondents at Ban Vinai and interviewed them six months later, their stories differed greatly. "Only one witness claimed to have seen one fatality resulting from the attack. The witness who, according to the (Canadian) submission, claimed to have observed 16 deaths, stated that this referred to 16 animals that died".<sup>42</sup> The reasons for the marked discrepancies between the Canadian and UN versions of the stated events and supposed consequences cannot be determined. But they suggest that Ottawa may have incautiously accepted other details of Hmong chemical warfare stories as well. Given the absence of any nonverbal evidence of deaths due to the chemical poisoning of the Hmong people by Vietnamese forces, the DEA Report cannot be cited to substantiate U.S. accusations of extensive chemical attacks in the Phu Bia area since 1975.

Health and Welfare Canada screened blood samples drawn from the four Ban Vinai witnesses for trichothecene toxins. The laboratory report states that the presence of trichothecenes in the blood samples "has not been established".<sup>43</sup> The bodies of two of these men were disfigured by skin lesions, but despite Ottawa's juxtaposi-

tion of photos showing these eruptions with the "yellow rain shower" accounts of the four unfortunate villagers, the Ban Vinai hospital doctors "did not know the cause of these skin lesions".<sup>44</sup>

Persistent and seriously vegetating skin lesions of the type shown in the DEA photographs are seldom caused by chemical burns.<sup>45</sup> The lesions, however, are compatible with severe superficial or deep fungal infections, or tuberculosis of the skin, all of which are endemic and constitute major medical problems in tropical Southeast Asia. It is also possible that the two men were burned or injured in some unknown way, and that the lesions resulted from a superinfection of their original wounds.

The UN Experts Group examined two Hmong refugees to Thailand who claimed that they were exposed to a chemical warfare attack two weeks earlier, and found "extensive skin rash on the abdomen, axillae (armpits), groins, buttocks and feet".<sup>46</sup> Subsequent clinical examination and laboratory tests revealed that the rashes had resulted from fungal infections of at least three months duration.

The Canadian investigators were unable to find any Hmong who saw the spraying of "yellow rain" from an aircraft. The UN Experts likewise noted that "very few" Hmong informants claimed to have observed an actual

aerial dissemination of "yellow rain". "In many cases, the persons involved only heard the passage of an aircraft but did not visually observe the aircraft".<sup>47</sup>

In its Report of November 1981, the Experts Group "found itself unable to reach a final conclusion as to whether or not chemical warfare agents had been used ... No clear characteristic physical findings of exposure to chemical agents could be recorded" among any of the Laotian and Kampuchean interviewees of the Experts Group, and "routine blood biochemical, hematological, and urine analyses obtained by the Group yielded no significant abnormalities".<sup>48</sup> Experts Report 2 re-emphasized that "the results of chemical analyses of samples received or collected by the Group are inconclusive".<sup>49</sup> The Experts Group acknowledged the depth and difficulty of its dependence on numerous accountgivers: "While the Group could not state that these ("yellow rain") allegations had been proven, nevertheless it could not disregard the circumstantial evidence suggestive of the possible use of some sort of toxic chemical substance in some instances".<sup>50</sup> In short, the Experts Group found little or no evidence of chemical poisoning by Vietnamese forces stronger than persistent circumstantial anecdotes of the Khmer Rouge and Vang Pao Hmong.

5. Conclusion: Time for Re-Evaluation

The most important proof of chemical poisoning is the detection of the original agent within the body. No known chemical warfare agents have been discovered in any of the "yellow rain" related human samples collected by Canadian researchers. Moreover, these investigators have not found any battlefield or environmental traces of recognizable chemical warfare compounds.

To uphold the "yellow rain" conjecture, Ottawa therefore depends on anecdotes and rumours reiterated by two parties who enjoy the institutional and political backing of the United States government: the Khmer Rouge army and the Hmong expatriates at Ban Vinai. Washington utilizes the "yellow rain" campaign to depict a

mounting chemical warfare threat from the Soviet Union, and calls for urgent countermeasures including the equipment of the U.S. armed forces with new-generation nerve gas munitions.

Given the absence of physical evidence for the "yellow rain" chemical-biological warfare conjecture, and the bias and internal contradictions in the verbal testimonies, the repeated suggestions bequeathed by Canada to the United Nations of "the possible use of some sort of toxic chemical substance" need re-evaluation. These speculations damage the effort to gain scientific and public support for comprehensive chemical-biological disarmament. The Canadian government should candidly acknowledge from the United Nations rostrum that the "yellow rain" paradigm does not fit the facts gathered in spite of themselves by its own investigators.

Notes

1. Richard Burt, Director, Bureau of Politico-Military Affairs, Department of State, at the Hearing on "Yellow Rain", Subcommittee on Arms Control, Oceans, International Operations and Environment, Senate Foreign Relations Committee. Washington, D.C., 10 November 1981, pp. 14-15.
2. Robert Dean, Deputy Director, Bureau of Politico-Military Affairs, Department of State, to an

on-the-record press briefing on "yellow rain". Washington, DC., 30 November 1982.

3. Chemical Warfare in Southeast Asia and Afghanistan (Special Report No. 98, Department of State, March 1982), included in U.S. Note Verbale to the Secretary-General, UN Document A/37/157, 24 March 1982, hereafter cited as Haig Report. Chemical Warfare in Southeast Asia and Afghanistan: An Update (Special Report No. 104, Department of State, November 1982), hereafter cited as

Shultz Report.

4. Security and Arms Control: The Search for a More Stable Peace. Washington, D.C.: Department of State, June 1983, p. 52.
5. The Soviet rebuttals of the Haig and Shultz Reports appeared respectively as Letter to the Secretary-General, A/37/233, 21 May 1982, and Letter to the Secretary-General, A/38/85, 7 February 1983.
6. Statement of Prof. James R. Bamberg to the Hearing on Foreign Policy and Arms Control Implications of Chemical Weapons, Subcommittee on International Security and Scientific Affairs, House Committee on International Affairs. Washington, D.C., 13 July 1982, p. 219. Prof. Bamberg chairs the Department of Biochemistry at Colorado State University.
7. Shultz Report, p. 5.
8. H.B. Schiefer, The Possible Use of Chemical Warfare Agents in Southeast Asia, Conflict Quarterly, Winter 1983, p. 36. Dr. Schiefer's detailed work appeared earlier, as Study of the Possible Use of Chemical Warfare Agents in Southeast Asia: A Report to the Department of External Affairs, 1982 hereafter cited as Schiefer Report. This paper was circulated as UN Document A/37/308, 24 June 1982. All citations refer to A/37/308.
9. Khmer Rouge is the conventional name for the army led by Pol Pot and Ieng Sary which took power in Phnom Penh in 1975. Before the Khmer Rouge regiments were routed from Kampuchea in 1979, they murdered or starved hundreds of thousands if not millions of citizens. For many Kampuchean, "the fear that blanketed them during the Pol Pot years has not been fully lifted ... they see Chinese and Thai support for Pol Pot's forces along the Thai frontier as an unfriendly act - one which justifies the continued presence of Vietnamese troops". Emory C. Swank, The Land in Between: Cambodia Ten Years Later, Indochina Issues. Washington, D.C., April 1983, p. 4. Mr. Swank served as U.S. ambassador to Kampuchea from 1970 to 1973.
10. "In 1971 United States Central Intelligence Agency personnel supervised the training of irregular forces and other paramilitary groups (in Laos). The largest single contingent of irregulars was in Military Region II (northeast of the Laotian capital of Vientiane, around the Plaine des Jarres), under the command of Major General Vang Pao". Area Handbook for Laos. Washington, D.C. 1982, p. 272.
11. G.R. Humphreys and J. Dow, An Epidemiological Investigation of Alleged CW/BW Incidents in SE Asia. Hereafter cited as Humphreys Report. Ottawa: National Defence Headquarters, 1982.
12. Shultz Report, p. 7.
13. Incapacitating agents are intended to cause temporary disease or to induce temporary mental or physical disabilities whose duration exceeds the period of exposure.
14. Report on Possible Use of Chemical Warfare Agents in Southeast Asia: Refugee Interviews at Ban Vinal, 5 May 1982. Hereafter cited as DEA Report. Ottawa: Department of External Affairs, 1982.
15. DEA Report, p. 14.
16. A map in the Humphreys Report,

Appendix 4 to Annex A, sites this camp in Khmer Rouge-held Kampuchea. Nong Pru itself is a town in Chantaburi Province, Thailand.

17. Schiefer Report, p. 16.
  18. Schiefer Report, p. 29.
  19. Dr. H.B. Schiefer, personal communication, May 1983.
  20. A December 1980 United Nations General Assembly resolution sponsored by Canada, seven other NATO countries, and New Zealand, empowered the Secretary-General to recruit medical and technical experts to investigate reports of chemical warfare. The Secretary-General appointed a four-member scientific team led by the Head of Scientific Research for the Egyptian Armed Forces, and including specialists from Kenya, Peru and the Philippines. The Group of Experts reviewed depositions by the U.S., Canada and several international organizations and interviewed refugees in Thailand and Pakistan, and issued the following two reports:
    - 1) Chemical and Bacteriological (Biological) Weapons, Report of the Secretary-General, A/36/613, 20 November 1981, hereafter cited as Experts Report 1;
    - 2) Chemical and Bacteriological (Biological) Weapons, Report of the Secretary-General, A/37/259, 1 December 1982, hereafter cited as Experts Report 2.
- Although the Experts Group has been dissolved, General Assembly resolution 37/98 D of 13 December 1982 called for the establishment of a new group of consultant experts "to devise procedures for the timely and efficient investigation of information concerning activities that may constitute a violation of the Geneva Protocol or the relevant rules of customary international law". This new panel was requested to submit a report to the General Assembly in September 1983.
21. Experts Report 2, p. 38.
  22. Humphreys Report, pp. 3-4.
  23. Humphreys Report, pp. 10 and B-2.
  24. Dr. G.R. Humphreys, personal communication, June 1983.
  25. Humphreys Report, p. B-11. Appendix 2 to Annex B of the Humphreys Report reprints an April 1981 Khmer Rouge document which states that atropine was routinely administered to casualties.
  26. Humphreys Report, pp. B-10 and B-11.
  27. Humphreys Report, p. B-10.
  28. Humphreys Report, p. 4, and p. 3 of Appendix 3 to Annex B.
  29. Dr. G.R. Humphreys, personal communication, June 1983.
  30. According to the Shultz Report, p. 11, the State Department delivered several grams each of the liver, intestine, stomach and kidney of Chan Mann to Dr. Timothy D. Phillips of Texas A & M University.
  31. Autopsy report written by Lt. Col. A.J. Byrne, A National Defence Medical Centre pathologist, pp. 1-4 of Appendix 3 to Annex B of the Humphreys Report.
  32. Humphreys Report, p. B-12.
  33. Shultz Report, p. 11.
  34. Shultz Report, p. 11.

35. Shultz Report, pp. 10-11.
36. Haig Report, p. 8. Out of 6,310 alleged chemical attack fatalities in Laos, 5,421 occurred in the Phu Bia area. The Shultz Report, p. 6, lists another 22 incidents in Laos, all from this area, in January-June 1982.
37. Schiefer Report, p. 24.
38. Humphreys Report, pp. F-12 and F-15.
39. Schiefer Report, p. 14. Dr. Schiefer qualifies this statement by observing (p. 33) that naturally occurring "cocktails" of trichothecenes are more potent than diets containing a single mycotoxin.
40. DEA Report, p. 2.
41. DEA Report, pp. 4, 7 and 12.
42. Experts Report 2, p. 23.
43. DEA Report, p. 14.
44. DEA Report, p. 2.
45. Dr. L. From, pathologist-in-chief, Women's College Hospital, personal communication. Toronto, August 1983.
46. Experts Report 2, p. 41.
47. Experts Report 2, p. 39.
48. Experts Report 1, pp. 34-35.
49. Experts Report 2, p. 49.
50. Experts Report 2, p. 50.

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