

September 2, 1983

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Table 1. The Environmental Samples From Southeast Asia That Have Been Analyzed for Trichothecenes (as of April 1983)

Sample Call number	Nature	Origin	Associated incident		Collection of sample		Receipt of sample		Analysis (by last indicated recipient, unless otherwise shown)							References and remarks		
			Date	Circumstances	Collector	Date	Recipient	Date	Amount recd.	Pollen seen in sample?	Analytical findings (parts per million, ppm)							
									T2	NIV	DON	DAS	HT2	ZEA	AFB <sub>1</sub>			
FS698A	Dried leaf & petiole fragments plus one intact leaf & stem.	Kampuchea: South of Phnom Mak Hoeun (TV3391) 102° 34'E 13° 28'N <150m	Mar 81	Deaths	Thai forces	4/24 hrs after attack	USEmb. Bangkok Hayes Mirocha	24 Mar 81	200mg	—	3.17	109	59.1	—	—	..	1,2,3,4,27,34 no sample remains(?)	
FS698B	Same sample spiked with 0.08mg T2 (400ppm)	ditto					Mirocha	Jul 81	200mg	—	35.7	21.7	0	—	—	..	1,2,3,	
FS704A	Water and floating material	ditto	ditto	ditto			Mirocha	10 Oct 81	10ml (33mg residue on evaporation)	—	0	0	0.22	trace	—	0	..	1,2,3, 27,28,3 66ppm DON based on 33mg residue.
Haig-C	"control" leaf ("similar vegetation")	USA(?)					Mirocha	Jul 81			0	0	0	..	..	..	1,2,3	

Legend: — not looked for; 0 looked for but not found; .. no information available

Table prepared by J. P. Perry Robinson and Matthew Meselson  
September 2, 1983

Table 1 (continued)

Sample Call number	Nature	Origin	Associated incident		Collection of sample		Receipt of sample		Analysis (by last otherwise shown)		Indicated recipient, unless							References and remarks
			Date	Circumstances	Collector	Date	Recipient	Date	Amount recd.	Pollen seen in sample?	Analytical findings (parts per million, ppm)							
											T2	NIV	DON	DAS	HT2	ZEA	AFB <sub>1</sub>	
FS704B	Rock scraping (yellow- green powder)	Laos: Phou Bia region, Muong Cha (TF9797) 103° 4' E 18° 57' N 1,500m	13 Mar 81 Noon	Sprayed from large 2-engined prop plane. Sounded like drizzle. Yellow Sticky, then dried. Illness and deaths	"Victim"	..	Mirocha	10 Oct 81	140mg (spilled)									1,2,3,13,34 pigments similar to those of F. roseum
FS704C	Rock scraping	Laos: Ban Thong Hak (TF9177) 103° 0' E 18° 46' N 900m	2pm 2 Apr 81	MiG-17 spray 24 of 450 villagers died, 47 more ill. Yellow spray, brown cloud.	Survivor (Soua Lee Vang)	..	<u>Soldier of Fortune</u> Rep. Leach U.S. Army Mirocha	6 May 81 July 81 .. 10 Oct 81	1mg (est. ca. 1mg) after methanol extraction					10 or 100?.. (10ng)			1,2,3,16,27,34	
Shultz- 14	"A set of envi- ronmental samples"	Laos: near Phu He	1982	Illness in collectors	..	..	..	..	..	(?)	"no trichothecenes detected"							2. These samples may be associated with the CAN-1 biomedical samples (see Table 2)
Bang- 1	yellow spotted leaves	Thailand: Bangkok	..	..	..	..	..	..	..	yes	..	..	..	..	..	..	..	20
Shultz- 9	Yellow spots on vegetation	Thailand: villages around Pong Nam Ron 102° 23' E 12° 54' N <300m	9:30am 19 Feb 82	Yellow powder from aircraft at 5000 ft.	Thai authorities	Feb 82	Several analysts:	Mirocha: Canadian: Neish:  Thai: Samaniya:	.. .. yes  .. yes	0.086 0 0 .030 .. .. .. ..	0 0 .. .. .. ..	0 .. .. .. .. ..	.030 .. .. .. .. ..	.. .. .. .. .. ..	.. .. .. .. .. ..	.. .. .. .. .. ..	2,34  2 2, 24. <i>Fusarium</i> spp. found in leaf but not spots. 17, 20. Toxic <i>Fusarium semi-</i> <i>sectum</i> iso- lated from 2 of 22 spots.	

Table 1 (continued)

Sample			Associated incident		Collection of sample		Receipt of sample		Analysis (by last indicated recipient, unless otherwise shown)		Analytical findings (parts per million, ppm)							References and remarks
Call number	Nature	Origin	Date	Circumstances	Collector	Date	Recipient	Date	Amount recd.	Pollen seen in sample?								
											T2	NIV	DON	DAS	HT2	ZEA	AFB <sub>1</sub>	
ABC News	Yellow powder scraped from vegetation	Laos: Phou Bia area (Ban Long Tiene)	..	Dead animals	Hmong soldier	Mar 81	Whitney (WVI, BanVinaf) A.D.Little Inc. .. Rosen	May 81	43mg	yes	48	0	58	43	..	265	..	6, 14, 15 PEG reported (6).
Crone 1-3	Yellow-spotted leaves & small pebbles	Laos	..	..	..	..	Crone	Apr 82		yes	Bioassay (rat skin lesion): no trichothecene activity found. Detection limit ca. 5ppm T2 or DAS.							7, 18
Crone 4	Yellow-spotted leaf fragments.	Laos, via Ma Fuang Thailand(?)	..	..	..	..	Crone	Apr 82		yes	ditto							7
FS709A	"control" water	Kampuchea: area around TV3391 102° 33' E 13° 28' N <300m	..	..	U.S. personnel	..	USAMIA Mirocha	20 Sep 81 1 Feb 82	50g	..	0	0	0	0	..	..	..	1,2,3 Limits of detection not stated.
FS709B	"control" soil	ditto	..	..	ditto	..	ditto	ditto	0.6g	..	0	0	0	0	..	..	..	ditto

Legend: — not looked for; 0 looked for but not found; .. no information available

Table 1 (continued)

Sample			Associated incident		Collection of sample		Receipt of sample		Analysis (by last indicated recipient, unless otherwise shown)								References and remarks	
Call number	Nature	Origin	Date	Circumstances	Collector	Date	Recipient	Date	Amount recd.	Pollen seen in sample?	Analytical findings (parts per million, ppm)							
											T2	NIV	DON	DAS	HT2	ZEA		AFB <sub>1</sub>
FS709C	"control" soil	Kampuchea: area around TV3391 102° 33' E 13° 28' N < 300m			U.S. personnel	..	USAMIA Mirocha	20 Sep 81 1 Feb 82	0.5g	..	0	0	0	0	..	..	..	1,2,3, Limits of detection not stated.
FS709D	"control" corn	ditto			ditto	..	ditto	ditto	25g	..	0	0	0	0	..	..	..	ditto
FS709E	"control" rice	ditto			ditto	..	ditto	ditto	25g	..	0	0	0	0	..	..	..	ditto
FS709F	"control" leaf	ditto			ditto	..	ditto	ditto	1.4g	..	0	0	0	0	..	..	..	ditto
FS709G	"control" leaf	ditto			ditto	..	ditto	ditto	0.5g	..	0	0	0	0	..	..	..	ditto
FS709H	"control" leaf	ditto			ditto	..	ditto	ditto	1.3g	..	0	0	0	0	..	..	..	ditto
FS709I	"control" leaf	ditto			ditto	..	ditto	ditto	1.3g	..	0	0	0	0	..	..	..	ditto

Legend: — not looked for; 0 looked for but not found; .. no information available

Table 1 (continued)

Sample			Associated incident		Collection of sample		Receipt of sample		Analysis (by last indicated recipient, unless otherwise shown)		References and remarks							
Call number	Nature	Origin	Date	Circumstances	Collector	Date	Recipient	Date	Amount recd.	Pollen seen in sample?		Analytical findings (parts per million, ppm)						
										T2		NIV	DON	DAS	HT2	ZEA	AFB <sub>1</sub>	
UN 1	Yellow powder scraped from rock in a rice field	Laos:	..	..	Lor Nao Pho (Hmong refugee to Ban Vinsi)	..	UNEIG 3 Labs	Nov 81 Summer 82	..	yes	Of the three labs analyzing for trichothecenes, two failed to find any, even in the spiked controls; the third found or suspected T2, NIV, DON and DAS in all its analyses, including the blank.	..	..					8,9
UN 2	Leaf and stem pieces	Laos:	..	..	Anon Hmong refugee	3 Oct 81	Townsend UNEIG 3 Labs	Oct 81 Nov 81 Summer 82	..	yes	ditto	..	..					8,9
UN 3	Yellow-spotted leaves	Laos: Nam San	18 Oct 82 Noon	Aircraft spray?	Ying Yang (farmer who fled to Thailand)	18 Oct 82	UNEIG FOA-4	Nov 82 Nov 82	..	..	Analysis for trichothecenes at Ume <sup>8</sup> but none found.	..	..					8
UN 4	Yellow-spotted leaves, water	Kampuchea: Sor Sann	29 Oct 82	Artillery illness	..	30 Oct 82	Catholic Office for Emergency Relief & Refugees UNEIG	Nov 82 Nov 82	..	..	.. .. . (Awaiting analysis at UN)	..	..					8

Legend: — not looked for; 0 looked for but not found; .. no information available

Sample Call number	Nature	Origin	Associated Incident Date Circumstances	Collection of sample Collector Date	Receipt of sample Recipient Date	Amount	Other/Analyte (by last indicated recipient, unless otherwise shown)	Pollen seen in sample?	Analytical findings (parts per million, ppm)	References and remarks
Shultz-13	"physical samples"	Laos	Mar/Apr(?) 82 ..	..	..	..	..	..	..	2, not cited in 36 "... consist of more residue of yellow rain containing mycotoxins from the same attacks that yielded human biological specimens positive for these same toxins."
Shultz-15	"New samples"	Kampuchea	June 82 ..	..	..	..	..	..	..	2, not cited in 34 "Quantitative tests indicate that the presence of trichothecenes is probable. The results of confirmatory analyses are pending."
Shultz-16	Contaminated vegetation and yellow residue	Kampuchea	Mar/May 82 Artillery and bombs	..	..	US Gov't. prior to 29 Nov 82	..	..	..	2 "Now being analyzed"
CAN-2	Yellow spots on small red popbles	Laos	..	..	pre-Feb 83	Meselson Nowicket?	..	yes	..	24
CAN-3	Yellow spots on leaves	Laos	Apr 82 ..	..	..	AG Can Meselson 19 May 82 July 83	..	yes	..	

Legend: — not looked for; 0 looked for but not found; .. no information available

Table 2. Biomedical Samples From Southeast Asia Analyzed for Trichothecenes

September 2, 1983

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Sample			Associated incident		Collection of sample		Receipt of sample		Analysis (by last indicated recipient, unless otherwise shown)							References and remarks	
Call number	Nature	Origin	Date	Circumstances	Collector	Date	Recipient	Date	Analysate	Analytical findings (parts per thousand million, ppb)							
										T2	NIV	DON	DAS	HT2	ZEA		AFB <sub>1</sub>
Shultz-1	Blood from ill Hmong couple	Laos: Phou Bia region	11 Nov 81 and 4 Jan 82	Subjects exposed to aircraft spray of greenish chemical.	Physician at Ban Vinai	21 Mar 82	Mirocha	..	man's blood: woman's blood:	13.5 0	— —	— —	0 0	0 0	— —	— —	2,34 N.b. elapsed time > 76 days
Shultz-2	Blood from Hmong man(?)	Laos: Phou Bia region	17 Mar 82	Low altitude helicopter spray. Sticky spots like yellow rain. Dried in 3-4 hours. 20 dead.	Physician at Ban Vinai	31 Mar 82	Mirocha	..	heparinized: non-heparinized:	19 3	— —	— —	0 0	0 2	— —	— —	2,34 N.b. elapsed time 14 days
Shultz-3	Blood from sick Hmong woman	Laos: Phou Bia region	25 Mar 82	Helicopter delivered yellowish agent. All 40 families in village affected. One woman died, and several animals.	Physician at Ban Vinai	6 Apr 82	Mirocha	..	heparinized: non-heparinized:	100 33	— —	— —	0 0	8 34	— —	— —	2,34 N.b. elapsed time 12 days
Shultz-4	Blood from three Hmong refugees	Laos: Phou Bia region	Late Mar 82	Yellow to reddish brown, sticky, drying to powder. Illness.	US physician	17 Apr 82	Mirocha	..	boy, aged 8 boy, aged 6 young girl	0 110 46	— — —	— — —	0 0 0	0 296 0	— — —	— — —	2,34 N.b. elapsed time ≥ 17 days 8 yr. old and girl had bloody diarrhea at time of sampling.

Legend: — not looked for; 0 looked for but not found; .. no information available

Table 2 (continued)

Sheet 2 of 4

Sample			Associated incident		Collection of sample		Receipt of sample		Analysis (by last indicated recipient, unless otherwise shown)								References and remarks
Call number	Nature	Origin	Date	Circumstances	Collector	Date	Recipient	Date	Analytate	Analytical findings (parts per thousand million, ppb)							
										T2	NIV	DON	DAS	HT2	ZEA	AFB <sub>1</sub>	
Shultz-5	Post-mortem blood from 25 yr. old Hmong male	Laos	Late Mar or early Apr 82	Aircraft?	Physician at Ban Vinsai	17 Apr 82	Mirocha	..	Heparinized blood	15	—	—	0	19	—	—	
FS726	Blood & urine from # number of soldiers.	Kampuchea: Tuol Chrey North of Khao Din	13 Feb 82 (dusk)	105-mm artillery attack on at least 100 soldiers 0.3km from Thai border. 17 hospitalized at Nong Pru.	KR physician Townsend and Canadian officials at Nong Pru.	14-16 Feb 82 and 4 Mar 82	Mirocha	..	PR's 14 Feb blood PR's 16 Feb urine PR's 4 Mar blood PN's 14 Feb blood PN's 15 Feb urine KV's 4 Mar blood MS's 4 Mar blood SN's 4 Mar blood CS's 4 Mar blood CR's 4 Mar blood	18 0 0 11 trace 7 0 0 0 0 3	— — — — — .. .. .. .. .. ..	— — .. — — .. .. .. .. ..	— — — — — .. .. .. .. ..	22 0 0 10 18 0 0 0 0 0	.. .. .. .. .. .. .. .. .. ..	.. .. .. .. .. .. .. .. .. ..	2,3,11,34 Findings of Canadian analyses for trichothecenes (22) still awaited. N.b. elapsed time 1-3 and 18 days.
FS731	Tissue samples from dead soldier, Chan Man (malaria?)	Kampuchea: Tuol Chrey	ditto	ditto	Kampuchean physician at Nong Pru	16 Mar 82	Mirocha and Phillips	..	Heart: Stomach: Liver: Kidney Lung: Intestine:	0 25.1 0 6.8 8.5 88	— — — — — —	— — — — — —	0 0 0 3 0 0	1200 4020 0 0 0 9.6	— — — — — —	— 19.8 20.2 15.3 11.2	2,3,34 Findings of Canadian analyses still awaited (23). And Rosen's. N.b. elapsed time 32 days.
Shultz-17	Blood and urine from an unexposed "group of individuals living under similar conditions" to the soldiers exposed at Tuol Chrey	..	..	..	..	Feb/Mar 82	Mirocha	..	Negative for all analyzed toxic agents, including trichothecenes.							2. Findings of Canadian analyses (23) still awaited. Canadian controls were urines from 4 KR soldiers from NongPru cam (not NongPru hospital patients).	

Sample Call number	Nature	Origin	Associated Incident	Date	Circumstances	Collector	Collection of sample		Receipt of sample	Recipient	Date	Analysis (by last indicated recipient, unless otherwise shown) Analyzate	Analytical findings (parts per thousand million, ppb)						References and remarks
							Date	Date					T2	NIV	DON	DAS	HT2	ZEA	
Shultz-8	Blood and urine from three survivors <300m	Kampuchea: near Pailin 102° 38' E 12° 51' N	Small Vlet aircraft spray of white powder. Artillery attack. Illness.	5 Mar 82			13 Mar 82		Hirocha	..		NH's blood	7	—	—	0	0	—	2, 34
				7 Mar 82			7 Oct 81 and sub-sequently		Microcha	9 Nov 81	Blood		NH's urine	5	—	—	0	2	—
FS712	Blood from 13 KR soldiers	Kampuchea: near Takong	Trip wire device. Illness.	19 Sep 81			7 Oct 81 and sub-sequently		Microcha	9 Nov 81	Blood	4	—	—	0	1	—	1, 3, 10, 34	
UN-5	Blood and urine from two Hmong refugees	Laos: Nam San	Aircraft spray. Illness	18 Oct 82		UNERIC	early Nov 82		FOA-4	Nov 82	Blood	0	—	—	0	1	—	N.b. elapsed time 18 days	
UN-6	Blood from 6 Hmong refugees	Laos	Walked through a field just after aircraft had sprayed yellow powder ("which looked like pollen grains").	17 Oct 81		UNERIC	early Nov 81		Three different labs	Summer 82	Blood	0	—	—	0	1	—	8	
CAN-1	Blood from 5 Hmong refugees	Laos Phu He area	1-5 incidents illness and death. Spray descending from a single aircraft heard but not seen.	Apr 82		Physicians at Ban Vmai	ca 5 May 82		Scott	..	Blood plasma	22	—	—	0	7	—	8, 9. These samples may be associated with the Shultz-14 environment: samples (Table 1). 25, 32. One of the refugees had gathered environmental samples that were handed to that border officials a to Hmong ca leadership. May be Shul 14?(Table 1)	

Initial indications of trichothecenes could not be confirmed.

Trichothecenes sought by all three labs but, with one exception, none found, even in the spiked (T2 and DAS) controls. In one sample presence of HT2 was suspected.

Trichothecenes sought, to detection limit in the range 10-100ppb, but none found.

Tentative identification of HT2 in samples from two of the soldiers.

Table 2 (continued)

Sample		Associated Incident			Collection of sample		Receipt of sample		Analysis (by last indicated recipient, unless otherwise shown)			References and remarks
Call number	Nature	Location	Date	Circumstances	Collector	Date	Recipient	Date	Analytate			
									T2	HT2		
US/UN-1	Blood from Lao resistance fighter	Laos: northern Vientiane Province	6 Nov 81	Grenade. Blindness for 30 min. Small blisters and edema for several days.	Examined by US and camp physicians at Nong Khai Hospital, Thailand	11 Nov 81	Mirocha(?)	..	blood blood blood	9 10 9	6 6 5	33,34 Negative for traditional cw agents. N.b. elapsed time 5 days.
US/UN-2	Blood from unstated number of Hmong refugees	Laos	3,11,16 Jan 82	Aircraft-delivered. Headache, nausea vomiting with blood, diarrhea with blood, vertigo, weakness, drunklike sensations, visual disturbances. 44/154 died in 2-5 days.	US and camp medical personnel at Nong Khai refugee camp, Thailand	24-26 March 82	Mirocha(?)	..	blood of 10 year old boy  other refugees	0(?)  0(?)	32  0(?)	33,34 Depressed white cell count, malaria. N.b. elapsed time >68 days.
US/UN-3	Blood from four Hmong	Laos	15 Feb 82	Two attacks on several vilages. 85-100 died. Fever, headache, nausea, vomiting, diarrhea, double vision, coughing, chest pain, eye irritation, tearing, hearing difficulty, fatigue, jaundice.	US and camp physicians at Nong Khai Hospital, Thailand	24-26 Mar 82	Mirocha(?)	..	blood of 35 year old male (also exposed mid-Dec 81)  blood of three other refugees	28  0(?)	16  0(?)	33,34 Chickens and pigs died. Crops affected. N.b. elapsed time 38-40 days.
US/UN-4	Blood from 3 control individuals				Nong Khai camp, Thailand	24-26 Mar 82	Mirocha(?)	..	blood of: three individuals	0	0	33
US/UN-5	Blood From 3 Kampuchean women	Kampuchea	4,5 Mar 83	Became ill March 9 after passing through area of reported attack on March 4 and 5.	Physicians at Khao Din refugee camp, Thailand	20 Mar 83	Mirocha(?)	..	blood of 18 yr.old woman 19 yr.old woman 25 yr.old woman	0 0 19	0 0 32	33,34 N.b. elapsed time 11-15 days.
US/UN-6	Blood from 2 control individuals living in same area				Physicians at Khao Din refugee camp	about 20 Mar 83	Mirocha(?)	..	blood of two individuals	0	0	33

Legend: \_\_\_ not looked for; 0 looked for but not found; .. no information available

Table 3. Samples from Afghanistan

Sample Call number	Nature	Origin	Associated incident		Collection of sample		Receipt of sample		Analysis (by last indicated recipient, unless otherwise shown)								References and remarks		
			Date	Circumstances	Collector	Date	Recipient	Date	Analyzate	Analytical findings (parts per million, ppm)									
										T2	NIV	DON	DAS	HT2	ZEA	AFB <sub>1</sub>			
Shultz- 10	Gas mask purchased in Kabul (?)	Afghanistan	..	..	..	Sep 81	..	..										T2 found by three labs on outer surface of mask but not on filters 1/2 -1µg on 1/4 of mask surface.	2,34
Shultz 11	Gas mask from dead Soviet soldier.	Afghanistan	..	..	..	Dec 81	..	..										Material from hose connections "indicative of the presence of" T2, DAS, verrucarol and zearalenone. No mycotoxin detected on filters.	2, not cited in 34
Shultz- 12	Unspecified vegetation	Afghanistan	..	..	..	Feb 82	..	..										"Preliminary analysis...indicates the presence of trichothecenes"	2, not cited in 34

Legend: — not looked for; 0 looked for but not found; .. no information available

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