US-Vietnamese Agent Orange Research, 1968-2007

Arnold Schecter[1], John D. Constable[2], Hoang Trong Quynh[3], Nirav Shah[1], Olaf Päpke[4]

1. University of Texas School of Public Health, Dallas Campus, Dallas, Texas, USA
2. Harvard Medical School, Boston, Massachusetts, USA
3. Institute for Sustainable Agriculture, Hanoi, Vietnam
4. Eurofins-ERGO, Hamburg, Germany

arnold.schecter@utsouthwestern.edu

APHA 2007, Nov 5, Wash. DC

Copyright 2007, Arnold Schecter, arnold.schecter@utsouthwestern.edu

Vietnam map: North and South

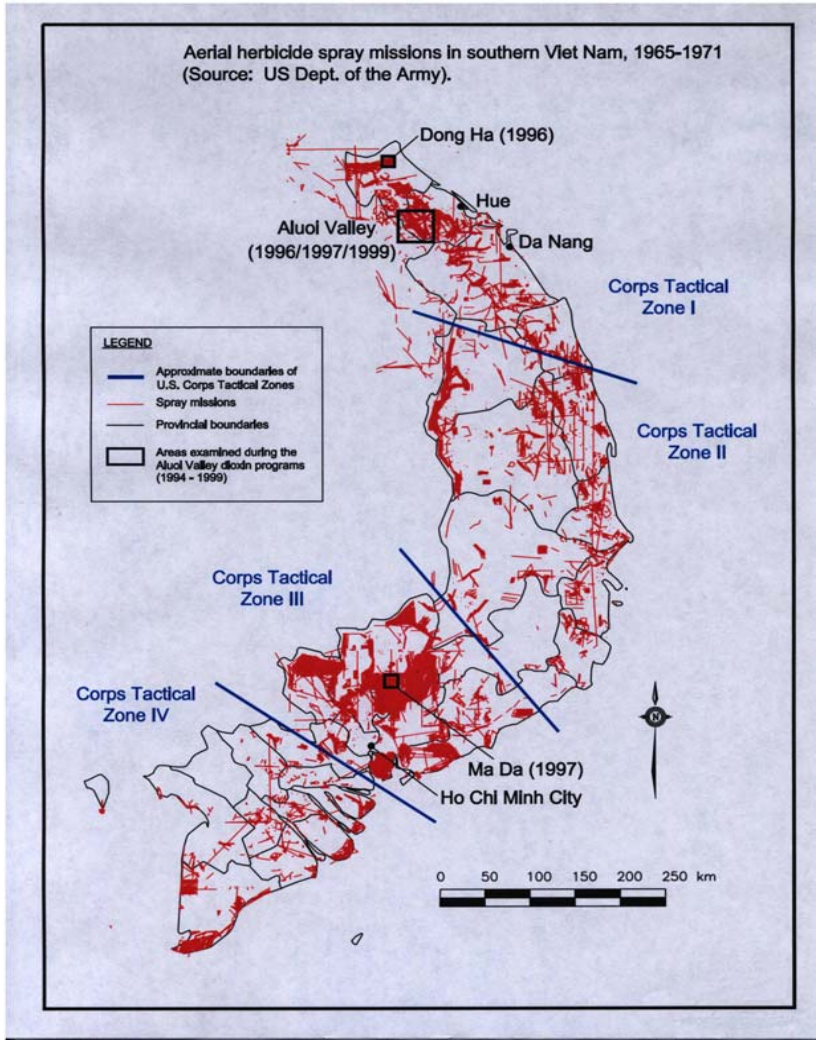
Copyright 2007, Arnold Schecter, arnold.schecter@utsouthwestern.edu

Agent Orange

- Agent Orange (AO) sprayed in Vietnam **1962-1971**
- Agent Orange: **half 2,4-D and half 2,4,5 T**
- 2,4,5-T herbicide contaminated with **2,3,7,8-TCDD** (most toxic dioxin)
- 3 PPM TCDD measured in Agent Orange
- Spraying was in parts of the **south of Vietnam** only, none sprayed in the north.

Copyright 2007, Arnold Schecter, arnold.schecter@utsouthwestern.edu

Vietnam Spraying missions
Red indicates sprayed area



Copyright 2007, Arnold Schecter, arnold.schecter@utsouthwestern.edu

Agent Orange Sprayed by Aircraft

85 % was sprayed from fixed wing aircraft

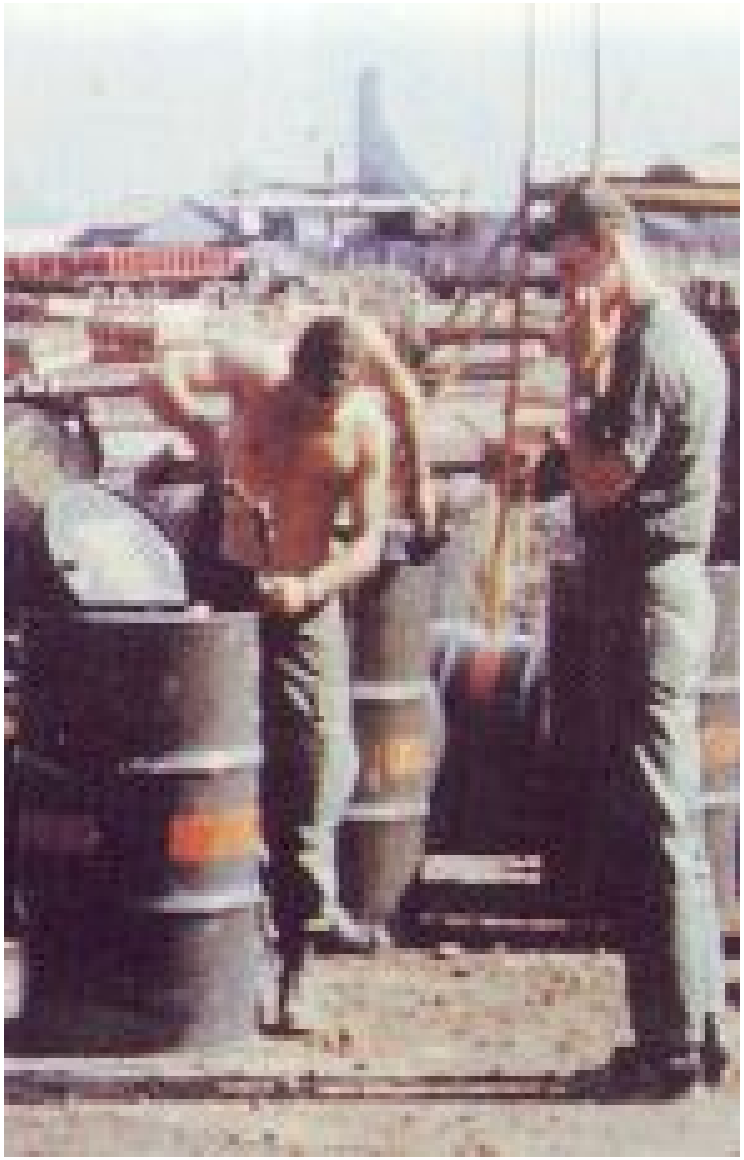
Copyright 2007, Arnold Schecter, arnold.schecter@utsouthwestern.edu

Agent Orange Spraying

15 % - sprayed from back packs, naval vessels and helicopters

Copyright 2007, Arnold Schecter, arnold.schecter@utsouthwestern.edu

Agent Orange



Copyright 2007, Arnold Schecter, arnold.schecter@utsouthwestern.edu

History

- 1968-71: First collection of Vietnam milk and fish for dioxin analyses by Vietnamese scientists and Drs. Constable and Meselson of Harvard

- **1970-1973**: **First dioxin (2,3,7,8-TCDD) analysis of humans and food** by **Baughman and Meselson**

- Very high dioxin levels from Agent Orange in **human milk**: Up to **1,820 parts per trillion (ppt), lipid-usual 1-2 ppt** and in **fish, upto 1000+ ppt, usual < 0.01 ppt**

Copyright 2007, Arnold Schecter, arnold.schecter@utsouthwestern.edu

History (Continued)

- 1971-1982: No US Vietnam Agent Orange collaboration
- 1983: First International Agent Orange Conference, Ho Chi Minh City, Vietnam
- 1983: US scientists included John D. Constable (MD), Maureen Hatch (PhD), Arthur Galston (PhD), E.W. Pfeifffer (PhD), Samuel S. Epstein (MD), Peter Ashton (PhD)

Copyright 2007, Arnold Schecter, arnold.schecter@utsouthwestern.edu

History (Continued)

- **1984**: **A. Schecter** and **J. Constable** began work with Vietnam's 10-80 Committee, in the north, middle and south of Vietnam.

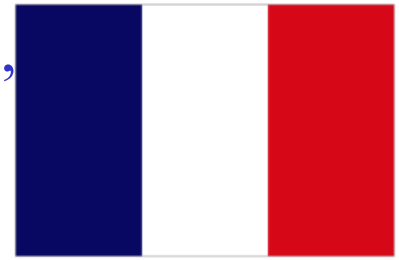
- 1984-2007: Several thousand human, food, wildlife and environmental samples collected and analyzed for dioxins and published in scientific journals

Copyright 2007, Arnold Schecter, arnold.schecter@utsouthwestern.edu

History (Continued)

- **From 1980's, key scientists:**

- **Prof. Hoang Dinh Cau** (physician), **Vietnam**
- **Prof Le Cao Dai** (physician), **Vietnam**
- **Prof Hoang Trong Quynh** (physician), **Vietnam**
- **Dr/Prof: Nguyen Ngoc Thi Phuong** (physician), **Vietnam**



- **Prof. Vo Quy** (ecologist), **Vietnam**
- **Sylvaine Cordier and Dennis Bard** (epidemiologists), **France**.
- **Vladimir Rumak and others** from **Russia & Vietnam** (Tropical Medicine Center)

Copyright 2007, Arnold Schecter, arnold.schecter@utsouthwestern.edu

History (Continued)

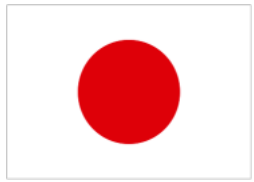
- **From 1984, key American (& Canadian) scientists:**

- **John D. Constable** (physician), **USA**
- **Prof. Michael Gross** (chemist), **USA**
- **John Jake Ryan** (chemist), **Canada**
- **Arnold Schecter** (physician), **USA**
- **Marian Pavuk** (physician-epidemiologist), **USA**
- **George Clark, USA, Vietnamese, and EPA** do biological screening for dioxins and related chemicals
- **Hatfield Group** (Environmentalists), **Canada**

Copyright 2007, Arnold Schecter, arnold.schecter@utsouthwestern.edu

History (Continued)

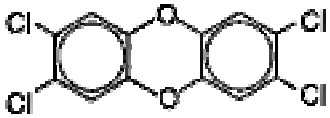
- **Other collaborating chemists in Vietnam Agent Orange studies**



- **Olaf Päpke** (chemist), **Germany**
- **Peter Fürst,** (chemist), **Germany**
- **Rainer Malisch** (chemist), **Germany**
- **Seppo Raisenen** (chemist), **Finland**
- **Muneaki Matsuda** (chemist), **Japan**
- **Vu Du Thao** (chemist), **Vietnam**
- **Joelle Prange** (chemist), **Australia**

Copyright 2007, Arnold Schecter, arnold.schecter@utsouthwestern.edu

Bien Hoa City is a highly TCDD contaminated 'Hot Spot'



- **95% of recent blood samples** from 43 persons had **elevated** (>5ppt) TCDD level, **up to 413** ppt.[1,2]
- **Soil TCDD** was **elevated, over 1 million** ppt.[2]
- **Sediment** TCDD was **elevated**.[2]
- **Elevated TCDD in some food.[3]**
- (Bien Hoa city contained an Agent Orange airbase for the US Air Force.)

1. Schecter, A et al. *J. Occup. Environ. Med.* 2001;43:435-443.
2. Schecter, A et al. *J. Occup. Environ. Med.* 2002;44:218-220.
3. Schecter, A, et al. *J. Occup.Environ.Med.* 2003; 45: 781-788.

Copyright 2007, Arnold Schecter, arnold.schecter@utsouthwestern.edu

Selected TCDD and TEQ in food from Bien Hoa, 2003 (ppt ww)

Samples	TCDD	Total TEQ	TCDD % of TEQ
Fish	65	66	99.0%
Duck	331	343	97.0%
Pork	0.025	0.6	4.2%
Chicken	0.031	0.83	3.7%

Fish: *Channa Striatta* (snakehead).

Schecter AJ et al. *J Occup Environ Med*. 2003; 45:781-788.

Copyright 2007, Arnold Schecter, arnold.schecter@utsouthwestern.edu

TCDD TEQ from Bien Hoa City and Aluoi Valley 'hot spots' (ppt)

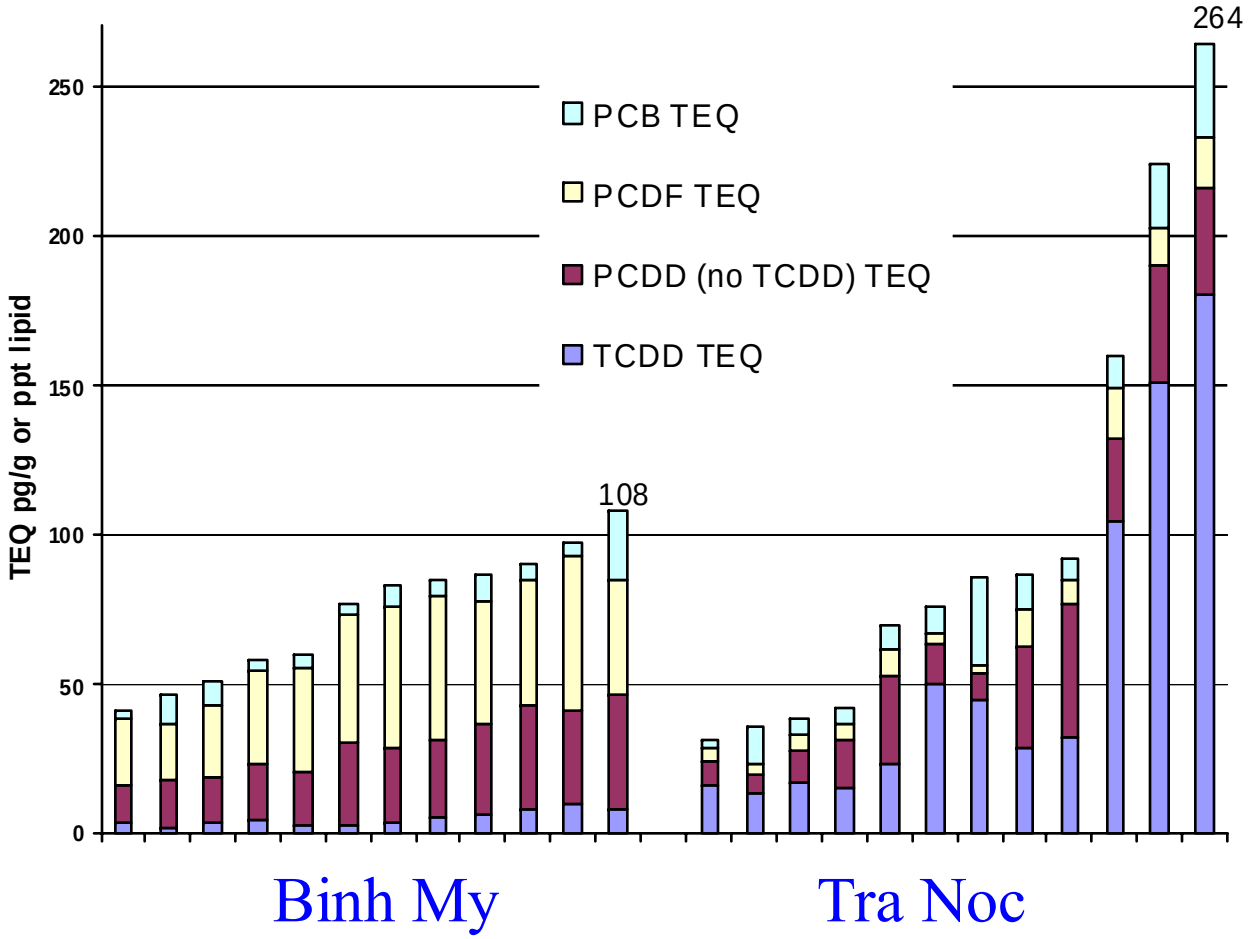
Aluoi Valley[1]	Samples	Based on	Bien Hoa[2]
85	Duck	Lipid	550
50	Fish	Lipid	15,349
5	Pork	Lipid	2.1
46	blood	Lipid	413
901	Soil	Dry wt.	1,100,000
35	Sediment	Dry wt.	190

1 Dwernychuk L, et al. *Chemosphere* 2002. 47:117-137.

2 Schecter A et al. *J Occup Environ Med*. 2003; 45:781-788.

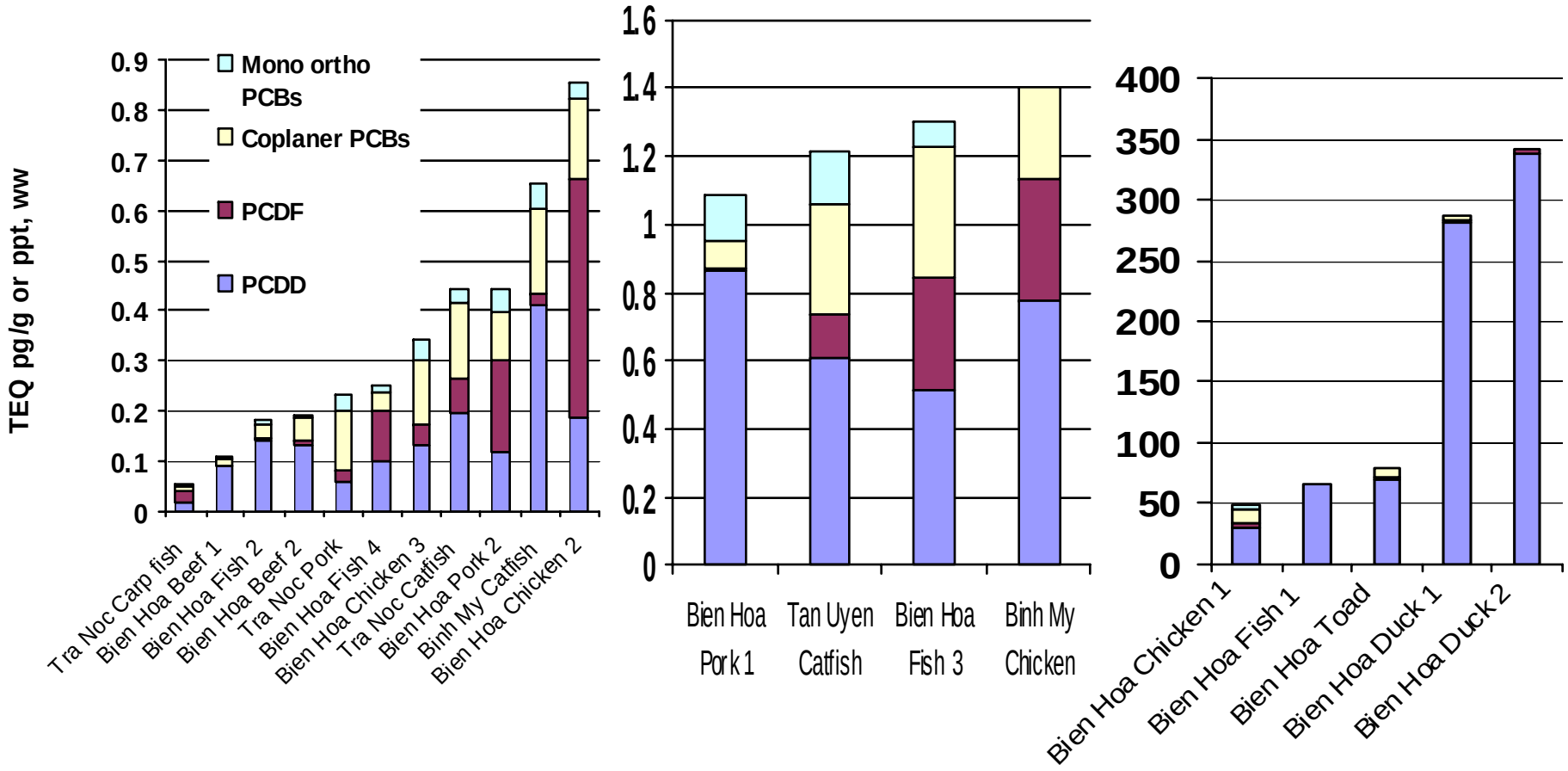
Copyright 2007, Arnold Schecter, arnold.schecter@utsouthwestern.edu

Human blood TEQ from two Agent Orange sprayed areas



Copyright 2007, Arnold Schecter, arnold.schecter@utsouthwestern.edu

TEQ levels in food from southern Vietnam, 2001-2003 ppt, ww



Copyright 2007, Arnold Schecter, arnold.schecter@utsouthwestern.edu

Organochlorine pesticides and PCBs in Vietnam milk and food (ppt ww)

- **α-HCH** or α-Hexachloro Cyclohexane
- **β-HCH** or β-Hexachloro Cyclohexane
- **γ-HCH** or γ-Hexachloro Cyclohexane
- **Hexachlorobenzene**
- **DDT**
- **DDT metabolites**
- **Many PCBs detected**

Schecter AJ et al. *J Occup Environ Med*. 2003; 45:781-788.

Copyright 2007, Arnold Schecter, arnold.schecter@utsouthwestern.edu

1. Results of Vietnam-US Agent Orange Research

- Elevated TCDD found in people in some parts of southern Vietnam.
- Very elevated TCDD in some people in a few hot spots in southern Vietnam
- Levels in some people from eating TCDD contaminated food were similar to levels during spraying (400 vs 1800 ppt)
- Levels of TCDD still elevated in some wildlife and some food (ducks, fish, chickens)

Copyright 2007, Arnold Schecter, arnold.schecter@utsouthwestern.edu

2. Results of Vietnam-US Agent Orange Research (Continued)

- Levels of TCDD in soil and sediment usually low (< 1 ppt). A few dioxin "hot spots" exist where Agent Orange was stored and spilled.
- Small monetary compensation now from Vietnam government to some "Victims of Agent Orange"
- Environmental remediation of some hot spots beginning by US and Vietnam governments and NGOs ~ 2007
- Efforts being made to keep contaminated food from being eaten

Copyright 2007, Arnold Schecter, arnold.schecter@utsouthwestern.edu

3. Results of Vietnam-US Agent Orange Research (Continued)

- **Lawsuit by Vietnamese filed in USA against chemical companies to help environment and people where TCDD contamination exists**
- **Efforts being made to provide health and financial assistance to potential Agent Orange exposed persons**
- **Vietnam and US NIH funded university health research begun but ended prematurely. Could be restarted.**
- **Plus: 20+ Year US Ranch Hand Air Force Health Study of Agent Orange Sprayers not functioning at present**

Copyright 2007, Arnold Schecter, arnold.schecter@utsouthwestern.edu

(US) "Veterans and Agent Orange, Update 2006" (No. 7, published 2007)

Institute of Medicine (IOM)

US National Academy of Sciences (NAS)

By law, diseases for which

A. A statistical association with herbicide exposure exists

B. Increased risk of disease among veterans exposed to herbicides or dioxin during Vietnam service.

C. There exists a plausible biological mechanism or other evidence of causal relationship between herbicide exposure and the disease.

Copyright 2007, Arnold Schecter, arnold.schecter@utsouthwestern.edu

Veterans and Agent Orange Update 2006, IOM/NAS (Continued)

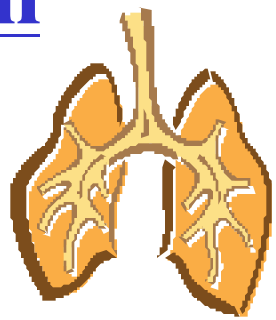
Sufficient Evidence of Association

A. Soft-tissue sarcoma (including heart)
B. Non-Hodgkin's lymphoma
C. Chronic lymphocytic Leukemia (CLL)
D. Hodgkin's Disease
E. Chloracne

Copyright 2007, Arnold Schecter, arnold.schecter@utsouthwestern.edu

Veterans and Agent Orange Update 2006, IOM/NAS (Continued)

Limited Evidence of Association



A. Laryngeal cancer

B. Cancer of the lung, bronchus or trachea

C. Prostate cancer

D. Multiple myeloma

E. AL amyloidosis (category change from Update 2004)

Copyright 2007, Arnold Schecter, arnold.schecter@utsouthwestern.edu

Veterans and Agent Orange Update 2006, IOM/NAS (Continued)

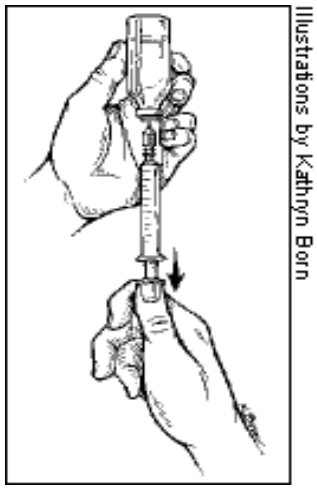
Limited Evidence of Association

F. Early-onset transient peripheral neuropathy

G. Porphyria cutanea tarda

H. Hypertension

I. Type 2 diabetes mellitus



Copyright 2007, Arnold Schecter, arnold.schecter@utsouthwestern.edu

Veterans and Agent Orange Update 2006, IOM/NAS

Inadequate or insufficient or limited but suggestive-committee could not decide

A. Melanoma

B. Breast cancer

C. Ischemic heart disease

Copyright 2007, Arnold Schecter, arnold.schecter@utsouthwestern.edu