
Item ID Number 01478

Author

Corporate Author

Report/Article Title Manuscript: Exposure Estimates for Herbicide Orange of Ranch Hand and ground troops in Vietnam

Journal/Book Title

Year 0000

Month/Day

Color

Number of Images 25

Description Notes

	TCDD = 94 mg/Kg 100% canopy Penet. 10% absorption	TCDD 94 mg/Kg 6% Canopy Penet 10% Abs	4	4
Dermal Exposure	2,4,5-T (mg/Kg) TCDD (mg/Kg)	2,4,5-T (mg/Kg) TCDD (mg/Kg)	T TCDD	T TCDD

Dermal Exposure	0.132	12.4	0.823	0.74	132	0.53	8	0.03
-----------------	-------	------	-------	------	-----	------	---	------

Inhal Exposure	15	1.41	0.9	0.084	15	0.065	0.9	0.004
----------------	----	------	-----	-------	----	-------	-----	-------

Total	<u>147</u>	<u>13.81</u>	<u>8.9</u>	<u>0.824</u>	147	0.595	8.9	0.034
-------	------------	--------------	------------	--------------	-----	-------	-----	-------

RPAR PEL	20,000	30	20,000	30	20,000	30	20,000	30
----------	--------	----	--------	----	--------	----	--------	----

No effect level for Cancer		1.0 (13.8)		1.0 (0.824)		1.0 (0.595)		1.0
----------------------------	--	----------------------------	--	-----------------------------	--	-----------------------------	--	-----

		Herbicide Purple				Herbicide Orange			
		TCDD = 94 mg TCDD/Kg 2,4,5-T				TCDD = 4 mg TCDD/Kg 2,4,5-T			
		100% Penet.		6% Penet		100% Penet.		6% Penet.	
Italian Decon. Std's		2,4,5-T (g/m ²)	TCDD (ug/m ²)	2,4,5-T (g/m ²)	TCDD (ug/m ²)	2,4,5-T (g/m ²)	TCDD (ug/m ²)	2,4,5-T (g/m ²)	TCDD (ug/m ²)
Homes - 0.01 ug/m ²		1.35	0.0007	0.08	0.00076	1.35	0.0054	0.08	0.0003
Outside homes - 0.75 ug/m ²									
Gardens - 5.0 ug/m ²									
Seveso Levels		TCDD = 32.8 mg TCDD/Kg 2,4,5-T				TCDD = 30 mg TCDD/Kg 2,4,5-T			
		100%		6%		100%		6%	
Zone	Range (ug/m ²)	T (g/m ²)	TCDD (ug/m ²)	T (g/m ²)	TCDD (ug/m ²)	T (g/m ²)	TCDD (ug/m ²)	T (g/m ²)	TCDD (ug/m ²)
A	ND - 5,000								
B	ND - 44	1.35	0.0007	0.08	0.00076	1.35	0.00405	0.08	0.0024

Deposition Rates in SVN

Threshold values for Decon adopted
by following recommendations of the
Medical - Epidemiological Commission
Sept 27 & Oct 11 76

Indoor levels 0.01 $\mu\text{g}/\text{m}^2$

Outdoor levels

(including appurtenances
of homes)

0.75 $\mu\text{g}/\text{m}^2$

Outdoor levels

(soils in gardens
& other areas)

5.0 $\mu\text{g}/\text{m}^2$

Ref: Regional Lombardy ~~Commission~~ Council
of Sanitation

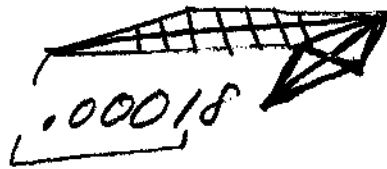
"Decontamination of Dioxin
Contaminated Areas"

as approved by the Regional
Council Sep 24, 1976

A. Giovanardi, 4 Dec 76.

zone adjacent to factory 2000 $\mu\text{g}/\text{m}^2$
Cuvonaidi

98% of TCDD in top 4cm of soil
"Nature" Vol 265, Feb 77 p 490


.00018

La Rosa
Kelly Info Ofc

Animals more susceptible
true of most pesticides

could compare \bar{c} Eglin & Severso

Levels of TCDD / m² @ Eglin ✓

" " " / " @ Severso ✓

" " " / " in RVN ✓

" " " / m² in Nesh/Beall

stds set by Lombardy Authority

Zone A: 96% of all samples
we $\leq 5000 \mu\text{g}/\text{m}^2$

$\bar{x} =$

<u>Ref</u>	<u>Zone</u>	<u>Area</u>	<u>Inhab</u>	<u>TCDD</u>	
①	A	$1 \times 10^6 \text{m}^2$	700	$50 - 1,000 \frac{\mu\text{g}}{\text{m}^2}$	
②	B	50.6 ha	800	50 - 1,000	50 ppm on leaves

① B $2 \times 10^6 \text{ m}^2$ 5,000 0.75-50 $\mu\text{g}/\text{m}^2$

② 199 ha 4,300 5-50 $\mu\text{g}/\text{m}^2$

③ $43.8 \mu\text{g}/\text{m}^2$
 $\bar{x} = 3.4 \mu\text{g}/\text{m}^2$

Respect (c)

② (c)

1/3:

Calculate amount of TCDD
per m² in RVN

Assume

$$HP = TCDD = 94 \text{ mg} / 10^6 \text{ mg}$$

$$HO = \text{ " } = 4 \text{ "}$$

Application rate 12 # 2,4,5-T/A

100% penetration

6% " "

$$\frac{100\%}{\text{A}} \times \frac{12 \text{ # } 2,4,5\text{-T}}{\text{A}} \times \frac{1 \text{ A}}{4,047 \text{ m}^2} \times \frac{\text{Kg}}{2.2 \text{ #}} = \frac{1.35 \text{ g}}{\text{m}^2}$$

6%

$$= \frac{0.08 \text{ g}}{\text{m}^2}$$

TCDD / HP

$$100\% \quad \frac{1.35 \text{ g}}{\text{m}^2} \times \frac{94 \text{ mg}}{10^6 \text{ g}} = 1.27 \times 10^{-4} \frac{\text{mg}}{\text{m}^2}$$

$$6\% \quad \frac{0.08 \text{ g}}{\text{m}^2} \times \frac{94 \text{ mg}}{10^6 \text{ g}} = 7.62 \times 10^{-6} \frac{\text{mg}}{\text{m}^2}$$

0.72

2/3:

TCDD/HO

$$100\% \quad \frac{1.359}{m^2} \times \frac{4 \text{ mg}}{10^6 \text{ g}} = 5.4 \times 10^{-6} \frac{\text{mg}}{m^2}$$

$$6\% \quad \frac{0.089}{m^2} \times \frac{4 \text{ mg}}{10^6 \text{ g}} = 3.2 \times 10^{-7} \frac{\text{mg}}{m^2}$$

According to Givaudan (10 Mar 77)
the TCDD levels at Seveso were

Area A	~	30 $\mu\text{g}/\text{m}^2$
" B		4 $\mu\text{g}/\text{m}^2$

According to W. Forth (Nov 77)

The TCDD levels at Seveso were
initially —

Area A	1,000 $\mu\text{g}/\text{m}^2$
Area B	$\leq 50 \mu\text{g}/\text{m}^2$

The calculated TCDD surface levels in RVN were:

HP %

6%	100%
7.62 ng/m^2	0.127 ug/m^2
(0.0076 ug/m^2)	

HO %

6%	100%
0.32 ng/m^2	5.4 ng/m^2
(0.0003 ug/m^2)	(0.0054 ug/m^2)

HP	TCDD	=	33 ppm
HO	"	=	30 ppm

TCDD in top 7cm

Ital std of $\frac{0.01 \mu\text{g}}{\text{m}^2}$

A- 5,000 $\mu\text{g}/\text{m}^2$

B. 50 $\mu\text{g}/\text{m}^2$

M < 5 $\mu\text{g}/\text{m}^2$

W. Forth NOV '77

Guwahati

10 Mar 77

<u>Zone</u>	<u>Range</u>	<u>Mean</u>	$\mu\text{g}/\text{m}^2$
B	ND - 43.8	3.93	
A6	ND - 270.4	29	
A7	ND - 91.7	15	
AN	ND - 21.2	—	

50,000
 $\mu\text{g}/\text{m}^2$

	Herbicide Purple				Herbicide Orange			
	TCDD = 32.8 mg TCDD/Kg 2,4,5-T				TCDD = 30 mg TCDD/Kg 2,4,5-T			
	100% Penet.		6% Penet.		100% Penet.		6% Penet.	
	2,4,5-T (ug/Kg)	TCDD (mg/Kg)	2,4,5-T (ug/Kg)	TCDD (mg/Kg)	2,4,5-T (ug/Kg)	TCDD (mg/Kg)	2,4,5-T (ug/Kg)	TCDD (mg/Kg)
Derma	132	4.33	8	0.262	132	3.96	8	0.240
Inhalation	15	0.49	0.9	0.030	15	0.45	0.9	0.027
Totals	147	4.82	8.9	0.292	147	4.41	8.9	0.267

	Herbicide Purple				Herbicide Orange			
	TCDD = 94 mg TCDD/Kg 2,4,5-T				TCDD = 4 mg TCDD/Kg 2,4,5-T			
	100% Peneto		6% Peneto		100% Peneto		6% Peneto	
	2,4,5-T (ug/Kg)	TCDD (mg/Kg)	2,4,5-T (ug/Kg)	TCDD (mg/Kg)	2,4,5-T (ug/Kg)	TCDD (mg/Kg)	2,4,5-T (ug/Kg)	TCDD (mg/Kg)
Dermal Exposure (head, neck shoulders, hands forearms, thighs) 10% absorption	132	12.4	8	0.74	132	0.53	8	0.03
Inhalation Exposure 100% absorption	15	1.41	0.9	0.084	15	0.065	0.9	0.004
Totals	147	13.81	8.9	0.824	147	0.595	8.9	0.034
		30						

p. IV-60 Table 9

Single oral dose
No effect
rat (male)

8 and 16 $\mu\text{g}/\text{Kg}$

Dow
Schewtj et al
1973

Injected in rabbit
(5 rabbits)

32 $\mu\text{g}/\text{Kg}$

Oral in Dog
(6 dogs)

30 - 300 $\mu\text{g}/\text{Kg}$

Inhalation Exposure

From RPAR

$$0.067 \text{ mg Malathion/m}^3 / 0.46 \#$$

$$\frac{0.067 \text{ mg/m}^3 \times 12 \#}{0.46 \#} = 1.748 \text{ mg/m}^3$$

$$1.748 \times \frac{1}{6} = 0.291 \text{ mg/m}^3$$

Resp rate of $1.8 \text{ m}^3/\text{hr}$
Exposure for 2 hr

$$\frac{0.291 \text{ mg}}{\text{m}^3} \times \frac{1.8 \text{ m}^3}{\text{hr}} \times 2 \text{ hr} = 1.05 \text{ mg T}$$

TCDD @ 94 mg/Kg

$$1.05 \text{ mg T} \times \frac{94 \text{ mg TCDD}}{10^6 \text{ mg T}} = \dots 98.7 \text{ mg TCDD}$$

For 70 Kg man 100% abs

2,4,5-T

0.015 mg/Kg

TCDD

1.41 mg/Kg

$$9.8 \times 10^{-5} \text{ mg}$$

$$9.8 \times 10^{-2} \mu\text{g}$$

$$98.7 \text{ mg}$$

TCDD @ 4 mg/Kg

4.2 x 10⁻⁶ mg
4.2 x 10⁻⁸ mg

(1.05) ($\frac{4}{10^6}$) = 4.6 mg TCDD

For 70 Kg man 100% abs

2,4,5-T	0.015 mg/Kg
TCDD	0.065 mg/Kg

For 6% penetration

TCDD @ 94 mg/Kg 70 Kg

9 x 10⁻⁴ mg/Kg
0.0009

2,4,5-T	0.063 mg	0.0009 $\frac{mg}{Kg}$
TCDD	5.92 mg	0.084 mg/Kg

TCDD @ 4 mg/Kg

2,4,5-T	0.0009 $\frac{mg}{Kg}$
TCDD	0.004 mg/Kg

(A)

Dermal exposure

(head, neck, shoulders, forearms, hands & thighs)

According to RPAIR

$$\frac{3.556 \text{ mg malathion}}{0.46 \text{ \#/gal} \cdot \text{Acre}} \times 3 \text{ gal/Acre} \times \frac{4 \text{ \# T}}{\text{gal}}$$

$$= 92.7 \text{ mg 2,4,5-T}$$

TCDD @ 94 mg TCDD/Kg T

$$92.7 \text{ mg T} \times \frac{94 \text{ mg TCDD}}{\text{Kg T}} \times \frac{\text{Kg}}{10^6 \text{ mg}}$$

$$= 0.009 \text{ mg TCDD}$$

Assuming 10% absorption

70 Kg man

$$2,4,5\text{-T} = 9.27 \text{ mg}$$

$$0.132 \text{ mg/Kg}$$

$$\text{TCDD} = 0.87 \mu\text{g}$$

$$12.4 \text{ mg/Kg}$$

TCDD @ 4 mg TCDD/Kg T

$$92.7 \text{ mg T} \times \frac{4 \text{ mg TCDD}}{\text{Kg T}} \times \frac{\text{Kg}}{10^6 \text{ mg}}$$

$$= 0.37 \mu\text{g TCDD}$$

70 Kg Man

$$10\% \text{ abs} =$$

$$\text{TCDD} = 0.037 \mu\text{g}$$

$$0.53 \text{ mg/Kg}$$

Assuming only 6% penetration:

~~TCDD @ 94 mg TCDD/kg~~

2,4,5-T

$$92.7 \text{ mg } 2,4,5\text{-T} (0.06) = 5.56 \text{ mg T}$$

$$\text{TCDD} = 5.56 \text{ mg T} \times \frac{94 \text{ mg TCDD}}{10^6 \text{ mg}} = 0.52 \text{ } \mu\text{g TCDD}$$

5.22×10^{-4}
mg
.52 μg

10% absorption:

2,4,5-T	=	0.56 mg T	$\frac{70 \text{ Kg}}{0.008 \text{ mg/Kg}}$
TCDD	=	52 mg TCDD	0.74 mg/Kg

TCDD @ 4 mg/10⁶ mg

$$0.56 \text{ mg T} \times \frac{4 \text{ mg TCDD}}{10^6 \text{ mg T}} =$$
$$\text{TCDD} = 2.24 \text{ mg TCDD} \quad 0.03 \text{ mg/Kg}$$

P62 Early care of Injured patient

			Total	
1/2				
3 1/2	Head		7	7
1	Neck	9	2	2
3	Shoulders	15	6	6
2	Upper Arms	23	4(2)	8
1 1/2	Forearms	29	3(2)	6
1 1/2	Hands	35	3(2)	6
10	Trunk	55	20	20
2 1/2	Elbows	60	5	5
4 3/4	Thighs	79	9 1/2(2)	19
3 1/2	Calf's	93	7(2)	14
1 1/4	Feet			
1 3/4		98	2 1/2(2)	5
1 3/4	Low Ankle		0 1/2	5
				102

head -	7
Shoulders -	6
Neck -	2
Forearms -	6
Thighs (front)	<u>10</u>

31% of body surface

Forearms	6
Hands	6
Thighs (front)	10
Calfe (front)	7
Feet Top	<u>3</u>
	32%

HERBS TAPE 11,261,429
 11,304,869

ORANGE

white 5,246,502

HERBS 5,246,612

Blue HAS 1,129,307
 1,127,307

Combat Tactical Zone

	Orange	White Blue	white
Region I	2,250,000	298,000	363,000
Region II	2,519,000	473,000	729,000
Region III ^{Savage}	5,309,000	294,000	3,719,000 3,718,000
Region IV	1,227,000	62,000	485,000
	<u>11,305,000</u>	<u>1,127,000</u>	<u>5,246,000</u>

HERBS TAPE

13 Dec. 79

GAO Thoughts

1. Maimers make a readily identifiable group —
2. However, assessment of exposure is extremely difficult if not impossible.
 - a. assume: maine unit of 1200 men was on site at time of spray
 - b. assume: all were down wind and that significant drift of spray occurred
 - c. assume: all 1200 men were at same location
 - d. assume: enough spray drifted to penetrate a thick triple canopy jungle
3. Categorization system as proposed will misclassify as "exposed" many who were not truly exposed
4. This will introduce bias and dilute a true effect if one existed
5. Due to ^{photo} degradation and the infrequency of ~~spray~~ drift heavy enough to penetrate thick foliage to ground level, the ~~best~~ most likely group to study is those ~~men~~ 5,900 maimers within 0.5 km on day 1

and those 16,500 within 1.5 km or day 1

6. Selection of a control group is not addressed.

7. ~~The~~ The ~~most~~ best approach is to await the RIVM mortality and/or morbidity study data before embarking on a study of this group

8. Perhaps an interim approach would be to do the Hopkins Mortality study on the ^{total} group of identified marines, taking time/photodegradation and distance into effect

9. This would not alleviate the problems of exposure misclassification/assumptions or control group selection