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ESTIMATED AMOUNTS OF TCDD EXPOSURE  
FROM A RANCH HAND SPRAY MISSION

We have summarized various estimates made for amounts of TCDD exposure of a serviceperson from the Ranch Hand spray mission. As we will briefly describe for each estimate many assumptions were made and entered into the calculation.

1. FLANDERS (CDC)

Dr. Flanders in his estimate of TCDD exposure from a single Ranch Hand spray assumed an extreme case scenario. He assumed that Agent Orange sprayed in Vietnam contained 47ppm of TCDD, that 5 gallons of Agent Orange were applied per acre of land, and that each gallon of Agent Orange weighed 10.7 pounds. Using these figures he calculated that the amount of TCDD/M<sup>2</sup> of land was 282ug. He further assumed that all Agent Orange sprayed on the jungle reached ground level, and that the whole body surface (not just head, shoulders, arms) was equally exposed to Agent Orange whether that part of the body was clothed or not. Using a body surface area of 1.85m<sup>2</sup>/servicemen, he was able to estimate the ug TCDD/serviceperson to be 522. Taking a 3% dermal absorption rate for TCDD he estimated that 16ug of TCDD would be absorbed into the serviceperson from a single direct exposure to a Ranch Hand spray mission. This is equivalent to 0.22ug per kg body weight for a 70kg serviceperson.

2. GOUGH (FORMERLY WITH OTA)

In his recent book, Gough presents as an appendix calculation of the amount of dioxin exposure of a person standing under a Ranch Hand spray mission. His extreme scenario, that is, a serviceperson standing in the open area while being sprayed on with Agent Orange containing 50ppm TCDD with the application rate of 3 gallons per acre resulted in 32.4ug of TCDD falling on a serviceperson's head and shoulders. Another extreme case was a serviceperson standing under jungle canopy while being sprayed on with Agent Orange containing 0.5ppm TCDD with the same application rate resulting in exposure to 0.02ug TCDD on the head and shoulders.

He had assumed that 6% of Agent Orange sprayed on the jungle would reach ground level. Assuming that 0.05% of TCDD contacted by the serviceperson would be absorbed by the body, the amounts of TCDD absorbed per kg body weight under these two scenarios were  $2.3 \times 10^{-4}$  and  $1.4 \times 10^{-7}$ , respectively.

3. STEVENS

Dr. Stevens in his calculation of TCDD exposure from a single Ranch Hand mission made many assumptions which were similar to Gough. For a 70kg serviceperson the amount of TCDD absorbed per kg body weight was estimated to be  $7 \times 10^{-6}$  ug.

**ESTIMATED AMOUNTS OF TCDD EXPOSURE  
FROM A RANCH HAND SPRAY MISSION**

	FLANDERS	GOUGH		STEVENS
		OPEN	JUNGLE	
TCDD/AO (ppm)	47	50	0.5	2
JUNGLE CANOPY	No	No	Yes	Yes
PROTECTIVE CLOTHING	No	Yes	Yes	Yes
DERMAL ABSORPTION	3%	Yes	Yes	Yes
ug TCDD/M <sup>2</sup> ground	282	180	1x10 <sup>-1</sup>	5x10 <sup>-1</sup>
ug TCDD/serviceman	522	32.4	2x10 <sup>-2</sup>	<1
ug TCDD absorbed/ serviceman	16	1.6x10 <sup>-2</sup>	1x10 <sup>-5</sup>	5x10 <sup>-4</sup>
ug TCDD absorbed/kg BW	2.2x10 <sup>-1</sup>	2.3x10 <sup>-4</sup>	1.4x10 <sup>-7</sup>	7x10 <sup>-6</sup>
Fraction of FDA's VSD of 13x10 <sup>-6</sup> ug (daily for 70 years) total 3.3x10 <sup>-1</sup> ug	48	4.8x10 <sup>-2</sup>	3x10 <sup>-5</sup>	1.5x10 <sup>-3</sup>
Fraction of MTD of 1x10 <sup>-1</sup> ug/kg	2.2	2.3x10 <sup>-3</sup>	1.4x10 <sup>-6</sup>	7x10 <sup>-5</sup>

VSD = Virtually Safe Dose

MTD = Minimum Toxic Dose calculated from Yusho exposure to TCDF.