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PRESENTATION OVERVIEW

RANCH HAND IN VIETNAM

EXPOSURE CONSIDERATIONS
- HERBICIDE
- APPLICATION
- FATE

PACER HO DATA

EGLIN AFB FL STUDY
- ENVIRONMENTAL FATE OF TCDD

US MILITARY PERSONNEL POTENTIALLY EXPOSED

TO HERBICIDE ORANGE

1. RANCH HAND PERSONNEL
2. SECONDARY SUPPORT PERSONNEL
   (NON-RANCH HAND)
3. GROUND TROOPS

ESTIMATED FREQUENCY OF EVENTS

1. DIRECT APPLICATION OF HERBICIDE ON GROUND TROOPS . . . . . UNIQUE

2. GROUND TROOPS MOVING INTO AREA TREATED WITHIN 24 HRS . . . . . RARE

3. GROUND TROOPS ENTERING A DEFOLIATED AREA (1 MONTH OR GREATER) . . . . . FREQUENT

CALCULATION OF EXPOSURE LEVELS

1. WOULD BE SUBJECT TO SPECULATION
2. MIGHT NOT REFLECT ACTUAL EVENTS
3. WOULD LACK MEANING SINCE "NO EFFECT" CRITERIA ARE NOT AVAILABLE

ESTIMATES OF POPULATIONS AT RISK
TO HERBICIDE ORANGE EXPOSURE

RANCH HAND	~ 1,200
NON-RANCH HAND SUPPORT	?
GROUND TROOPS IN DEFOLIATED AREAS	>1,000,000

EXPOSURE SPECULATION

SIZE OF INDIVIDUAL

BODY SURFACE EXPOSED

ROUTE OF EXPOSURE

FREQUENCY OF EXPOSURE

TIME EXPOSED

TYPE OF HERBICIDE

CONCENTRATION OF TCDD

PERTINENT EXPOSURE PARAMETERS

I. NATURE OF THE HERBICIDE
   - CHEMICAL & BIOLOGICAL FACTORS

II. NATURE OF HERBICIDE APPLICATIONS
   - HANDLING & QUANTITIES SPRAYED

III. ENVIRONMENTAL FATE

I. A. CHEMICAL FACTORS

CONC. FORMULATION (8.6 LB AI/GAL)

WATER INSOLUBLE (DENSITY = 1.28)

VAPOR PRESSURE (3.6×10^{-4}, 30°C)

NBE 2,4-D : 1.2×10^{-4}

NBE 2,4,5-T: 0.4×10^{-4}

TCDD : 1×10^{-7}

VISCOUS (40 AT 20°C)

NONCORROSIVE TO METAL

DELETEROUS TO PAINTS, RUBBER, NEOPRENE

LONG SHELVE LIFE

I. B. BIOLOGICAL FACTORS (HERBICIDE)

PLANT ABSORPTION - RAPID (HOURS)

PLANT METABOLISM - RAPID (DAYS)

ANIMAL ABSORPTION - READILY (INGESTED)

HUMAN SKIN ABSORPTION ~ 6% IN 5 DAYS

TOXICITY (LD_{50}, RATS)

566 MG/KG (ORAL)

390 MG/KG (INHALATION)

TCDD CONCENTRATIONS

HERBICIDE ORANGE

1965-1970

488 SAMPLES

RANGE: < 0.02 - 15PPM

WEIGHTED MEAN: 1.98PPM

HERBICIDE PURPLE

1962-1965

5 SAMPLES

RANGE: 17 - 47PPM

MEAN: 32.8PPM

II A. APPLICATIONS OF HERBICIDE ORANGE

FOREST DEFOLIATION ~ 90%

CROP DESTRUCTION ~ 8%

BASE PERIMETERS/CACHE SITES ~ 2%

II B. APPLICATION PARAMETERS (C-123)

SPEED: 130 KIAS

ALTITUDE: 150 FT

TANK VOLUME: 1,000 GAL

SPRAY TIME: 3.5-4 MIN

MEAN PARTICLE VOL: 0.61mm

SPRAY SWATH: 260±20 FT

MEAN DEPOSITION: 3 GAL/ACRE

TOTAL AREA/TANK: ~ 340 ACRES

II C. HANDLING OF HERBICIDES

DRUMS MARKED WITH COLORED BAND

SHIPPING TIME FROM U.S. ~ 50 DAYS

0.1% DRUMS DEFECTIVE

DISTRIBUTION: 65% TO SAIGON

35% TO DA NANG

DRUMS TRANSPORTED TO RANCH HAND SQUADRONS

HERBICIDE TRANSFER TO F-6 TRAILERS

DRUM DRIPPINGS FOR BASE PERIMETERS

EMPTY DRUMS TO RUNWAY/BUNKER CONST.

AIRCRAFT LOADED FROM F-6 TRAILERS

III. ENVIRONMENTAL FATE

HERBICIDES AND TCDD

AIR

VEGETATION

SOILS

III A. FATE IN AIR (HERBICIDE)

PARTICLE SIZE

<100μ 1.9%

100-500μ 76.2%

>500μ 21.9%

87% IMPACT WITHIN 1 MIN

13% DRIFT/VOLATILIZE (?)

PHOTODEGRADATION

III B. FATE ON VEGETATION (HERBICIDE)

MULTICANOPY FOREST INTERCEPTED ~ 94%

GROUND - LEVEL DEPOSITION ~ 6%

(0.17 GAL/A = 1.4 LB AI/A)

CUTICULAR PENETRATION OCCURRED WITHIN 30 MIN

III C. FATE IN SOILS

IN TROPICAL SOILS

T 1/2 2,4-D ~ 7 DAYS

T 1/2 2,4,5-T ~ 14 DAYS

SITE OF 3 GAL ORANGE/A SUPPORTED CROP GROWTH IN 4 MONTHS

ENVIRONMENTAL FATE OF TCDD

RAPID PHOTODEGRADATION IN AIR/PLANT SURFACE

(CROSSBY, > 98% IN 6 HR)

(NASH, 86% IN 32 HR)

MIN TRANSLOCATION IN PLANTS

NEG. PLANT UPTAKE

SOIL: 20% PHOTODEGRADES IN 6 HR

$T_{1/2}$ WITH HERBICIDE = 1 YEAR

$T_{1/2}$ WITHOUT HERBICIDE = 3 YEARS

BIOACCUMULATION IN ANIMALS

(EGLIN AFB STUDY)

PACER HO ENVIRONMENTAL DATA

WATER: 76 SAMPLES COLLECTED ADJACENT TO INVENTORY

2,4-D = 393 NG/L (PPT)
2,4,5-T= 182 NG/L
TCDD = ND (5 PPT)

DOWNWIND AIR:

2,4-D = 6 $\mu G/M^3$
2,4,5-T= 4 $\mu G/M^3$
TCDD = ND (11 NG/M^3)

PACER HO INDUSTRIAL HYGIENE DATA ($\mu G/M^3$)

IN DEDRUM OPERATIONS

AIR:	2,4-D	18.8
	2,4,5-T	7.4
	TCDD	ND ($6NG/M^3$)

BREATHING ZONE OF DRUM PUNCHERS

	2,4-D	23.2
	2,4,5-T	13.7
	TCDD	ND ($8NG/M^3$)

TLV OF HERBICIDES = 10,000 $\mu G/M^3$