

Monsanto

Monsanto Company
800 N. Lindbergh Boulevard
St. Louis, Missouri 63166
Phone: (314) 894-1000

February 24, 1984

Dr. Myron S. Weinberg
Weinberg Consulting Group, Inc.
Suite 301
2828 Pennsylvania Avenue, N.W.
Washington, DC 20007

Dear Myron:

I have attached draft copies of Ms. Johnson's tables for her report on industrial/environmental accidents involving TCDD. There are three tables relating to industrial, laboratory, and environmental accidents. We will send the referenced articles when we complete the draft report.

Since Ms. Johnson is my only industrial hygienist, I have had to limit her assignment to process chronologies until we get them into draft form, at which time she will complete the report on accidents. I expect that she will be able to go back to work on this in mid to late March.

Sincerely,

A.M. Ford

Allan M. Ford, Ph.D.

/dkr
Attachments

cc: Mr. R. J. Barnes - Townley & Updike
Mr. T. M. Bistline/Mr. D. F. Snively - Monsanto Company
Mr. C. M. Love, III - Bowles, McDavid, Graff & Love
Dr. W. J. McCarville - Monsanto Company

C23836

DDs)

# PERSONS EXPOSED	SYMPTOMS	# ANIMALS EXPOSED	SYMPTOMS	REFERENCES
# PERSONS AFFECTED		# ANIMALS AFFECTED		
20 cases reported	Alleged birth defects and malformations (anencephaly; spina bifida). Study indicated that the number of cases reported were not significantly different from expected; no correlation found with spraying of 2,4,5-T.	—	—	68,86
6 affected	Chloracne	—	—	38
—	—	—	—	21
4 cases reported	Increase in perinatal death & birth defects. Study indicated the number of perinatal deaths are within normal frequency for the region; no correlation found with spraying of 2,4,5-T.	Study conducted on animals in the area.	No increase in illness.	68

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TABLE 3: Summary of Incidents Resulting in Possible Environmental Contamination with 2,3,7,8-TCDD or other Polychlorinated Dibenzo Dioxins (PCDDs)

DATE OF INCIDENT	LOCATION	INCIDENT RESULTING IN ENVIRONMENTAL CONTAMINATION	SOURCE OF CONTAMINANT	CONTAMINANT LEVELS	EXPOSURE ROUTE	# PERSONS EXPOSED	SYMPTOMS	# ANIMALS EXPOSED
						# PERSONS AFFECTED		# ANIMALS AFFECTED
1944-present; reported in 1975-1976	New Zealand	Shrub control by spraying defoliant.	2,4,5-T	4×10^{-7} g/acre		20 cases reported	Alleged birth defects and malformations (anencephaly; spina bifida). Study indicated that the number of cases reported were not significantly different from expected; no correlation found with spraying of 2,4,5-T.	
1945	Berlin/Germany	Frying of vegetables in a fat-like substance found in the bomb ruins.	Substance thought to have been hexachloronaphthalene N. A. ^a		Ingestion	6 affected	Chloracne	
1949-1971	Australia-Union Carbide of Australia Limited	Landfilling of wastes from production of 2,4,5-TCP and 2,4,5-T	Dioxin contaminated 2,4,5-TCP and 2,4,5-T wastes.	16-30kg dioxin.	NO INCIDENT OF EXPOSURE REPORTED			
1950-present reported in 1975-1977	Yarram, Victoria/ Australia	Shrub control by spraying defoliant.	2,4,5-T	N. A.		4 cases reported	Increase in perinatal death & birth defects. Study indicated the number of perinatal deaths are within normal frequency for the region; no correlation found with spraying of 2,4,5-T.	Study conducted on animals in

a. N. A. - not available

benzo Dioxins (PCDDs)

EXPOSURE ROUTE	# PERSONS EXPOSED	SYMPTOMS	# ANIMALS EXPOSED	SYMPTOMS	REFERENCES
	# PERSONS AFFECTED		# ANIMALS AFFECTED		
Ingestion	None reported from consumption of chicken.	None reported.	Millions of chickens	Dyspnea, wobbly gait, stunting, subcutaneous edema, sudden death. At necropsy revealed ascites; hydropericardium; hemorrhages; swollen, pale, irregular livers.	2,86
Dermal, possible inhalation	N. A.	Increase in mortality to certain cancers. Study showed no increase in overall mortality or cancers due to 2,4,5-T use.	—	—	3
Possible dermal, ingestion, inhalation	Many South Vietnamese and American veterans exposed.	Various maladies alledged due to "Orange" exposure including: birth defects, increased abortion rates, skin disorders, CNS disorders, cancer, liver disorder, etc.	Many exposed.	Various	2,11,21,30,68,76,86

NOTE: Many studies have been conducted on the populace of South Vietnam and American veterans. Many are conflicting in their findings and in general the validity of the conclusions reached from these epidemiologic studies maybe questionable.

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TABLE 3: Summary of Incidents Resulting in Possible Environmental Contamination with 2,3,7,8-TCDD or other Polychlorinated Dibenzo Dioxins (PCDDs)

DATE OF INCIDENT	LOCATION	INCIDENT RESULTING IN ENVIRONMENTAL CONTAMINATION	SOURCE OF CONTAMINANT	CONTAMINANT LEVELS	EXPOSURE ROUTE	# PERSONS EXPOSED	SYMPTOMS
						# PERSONS AFFECTED	
1957-1960	United States	Chick Edema Disease. Adulteration of chicken feed with low cost fats to increase caloric value of feed.	Fats pooled from many sources. Upon processing they had to be heated..... residues of commercial-chlorophenols were probably converted to dioxin, the chick edema factor.	N.A.	Ingestion	None reported from consumption of chicken.	None reported.
1957-1972; reported in 1972	Sweden	Railway workers exposed to phenoxyacetic acid herbicides and others during use on the railroads.	2,4,5-T and 2,4-D	N. A.	Dermal, possible inhalation	N. A.	Increase in mortality of certain cancers. Study showed no increase in overall mortality of cancers due to use.
1962-1970	South Vietnam	Spraying of Agent Orange defoliant to control vegetation during war.	2,4,5-T and 2,4-D contained 2,3,7,8-TCDD as contaminant	2x10 ⁸ kg of 2,4,5-T sprayed on 1.2x10 ⁶ ha; contained 167kg TCDD.	Possible dermal, ingestion, inhalation	Many South Vietnamese and American veterans exposed.	Various maladies due to "Orange" including: birth defects, increased abortion, skin disorders, cancer, etc.

NOTE: Many studies have been conducted on the health of American veterans. Many are consistent with the general validity of the conclusions.

DDs)

# PERSONS EXPOSED	SYMPTOMS	# ANIMALS EXPOSED	SYMPTOMS	REFERENCES
# PERSONS AFFECTED		# ANIMALS AFFECTED		
5	Chloracne	—	—	86
2,500 exposed; 1,665 affected	Chloracne, eye discharge, edema of upper eyelids, asthenia, visual dis- turbance, vomiting, diarrhea, jaundice, increase in cholestrol & triglycerides, no birth defects.	2x10 ⁶ chickens 0.4x10 ⁶ chickens	Illness Death	38,76
None reported due to consumption of contaminated chickens.	None reported	Many chickens	Same as before; dioxin shown to accumulate in edible tis- sue of chicken.	90
Not Given	Alleged illness Studies showed no evidence of increased illness or reproductive effects due to spraying 2,4,5-T.	Not Given	Alleged illness, and birth defects. Studies showed no evidence of increased illness or reproductive effects due to spraying 2,4,5-T.	86

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TABLE 3: Summary of Incidents Resulting in Possible Environmental Contamination with 2,3,7,8-TCDD or other Polychlorinated Dibenzo Dioxins (PCDDs)

DATE OF INCIDENT	LOCATION	INCIDENT RESULTING IN ENVIRONMENTAL CONTAMINATION	SOURCE OF CONTAMINANT	CONTAMINANT LEVELS	EXPOSURE ROUTE	# PERSONS EXPOSED	SYMPTOMS
						# PERSONS AFFECTED	
1966	Columbia	Spraying of weed killers	2,4,5-T	N. A.		5	Chloracne
1968	Yusho/Japan	Contamination of rice bran PCBs and TCDFs oil with PCBs containing TCDFs. • Oil incorporated into chicken feed. • Oil used for home cooking.		1ppm TCDFs in the oil; average dose to humans was 2.1-3.0 ug TCDF/kg.	Ingestion		
1969	United States	Chick Edema Disease. Adulteration of chicken feed with low cost fats to increase caloric value of feeds.	Soapstock or by-product from refining crude vegetable oil contaminated with chlorophenols.	N. A.	Ingestion	2,500 exposed; 1,665 affected	Chloracne, eye edema of upper extremities, asthenia, visual disturbance, vomiting, diarrhea, jaundice, increase in cholesterol & triglycerides, birth defects.
1969	Globe, Arizona/ United States	Forestry management by spraying of defoliants.	2,4,5-T; Silvex	54kg. 2,4,5-T and 1,670kg Silvex in the Kellner Canyon Russel Gulch Project. Contained approximately 1ppm TCDD.		None reported due to consumption of contaminated chickens.	None reported
						Not Given	Alleged illness
							Studies showed evidence of illness or reproductive effects due to 2,4,5-T.

ins (PCDDs)

UTE	# PERSONS EXPOSED	SYMPTOMS	# ANIMALS EXPOSED	SYMPTOMS	REFERENCES
	# PERSONS AFFECTED		# ANIMALS AFFECTS		
	2	Alleged congenital malformation of infants.	30 reindeer 10 reindeer	Death Abortion of fetus	86
		• Study indicated death due to starvation not exposure to 2,4,5-T or dioxin even though low level 2,4-D (≤ 0.5ppm) and 2,4,5-T (≤ 0.3ppm) found in liver and kidney samples. • Feeding study using contaminated (25 ppm 2,4-D and 100 ppm 2,4,5-T) leaves fed to reindeer indicated no adverse health effects due to exposure.			
ermal,	N.A.	Six fold increase in soft tissue cancer.			68

le dermal, a. 5 total: , ingestion. 1-six yr. old girl	Possible chloracne, headaches, diarrhea, nose-bleeds, painful mitriculation, blood in urine (hemorrhagic cystitis).	85 horses exposed, 61 became ill, 48 died.	Emaciation, acne dermatitis, blood in urine, edema, conjunctivitis, lameness, abortions, liver dysfunction, reduced spleen size, lymph nodes small & inactive, ascites, bowel hemorrhages.	2,6,11,12,18,39,68,76,86
1-10 yr. old girl	Possible chloracne, abdominal pain., diarrhea, recurrent headaches.	Many mice, cats, dogs.	Dermatitis, loss of hair, weight loss, death.	

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TABLE 3: Summary of Incidents Resulting in Possible Environmental Contamination with 2,3,7,8-TCDD or other Polychlorinated Dibenzo Dioxins (PCDDs)

DATE OF INCIDENT	LOCATION	INCIDENT RESULTING IN ENVIRONMENTAL CONTAMINATION	SOURCE OF CONTAMINANT	CONTAMINANT LEVELS	EXPOSURE ROUTE	# PERSONS EXPOSED	SYMPTOMS
						# PERSONS AFFECTED	
1970	Visttrask, Lapland/ Sweden	Forestry management by spraying of defoliant.	2,4-D and 2,4,5-T	0.67kg/ha. 0.34kg/ha.	Ingestion	2	Alleged congenital malformation of • Study indicated dioxin even though found in liver • Feeding study 2,4,5-T leaves due to exposure
1970-1976	Sweden	Forestry workers, farmers, sawmill workers exposed to phenoxy acetic acids.	2,4,5-T and 2,4-D	N.A.	Possible dermal, inhalation	N.A.	Six fold increase in tissue cancer.
1971	Eastern Missouri/ United States: a. Horse arena A b. Horse arena B c. Horse arena C d. Horse arena D and road	Horse arenas and roads sprayed with waste sludge containing distillate residues of hexachlorophene production to control dust.	Distillate residues of hexachlorophene production containing TCP and 2,3,7,8-TCDD (~12 lbs of TCDD total in waste residues hauled by R. Bliss)	306-356ppm TCDD in waste residue tank a. 31-33ppm TCDD in soil of arena.	a. Possible dermal, inhalation, ingestion.	a. 5 total: 1-six yr. old girl 1-10 yr. old girl	Possible chloracne, diarrhea, painful urination, in urine (hematuria, cystitis). Possible chloracne, recurrent headache

TABLE 3: Summary of Incidents Resulting in Possible Environmental Contamination with 2,3,7,8,-TCDD or other Polychlorinated Dibenzo Dioxins (PCDDs)

DATE OF INCIDENT	LOCATION	INCIDENT RESULTING IN ENVIRONMENTAL CONTAMINATION	SOURCE OF CONTAMINANT	CONTAMINANT LEVELS	EXPOSURE ROUTE	# PERSONS EXPOSED
1971 - Missouri continued						1-adult, male
						1-adult, female
						1-adult male at arena A collecting samples)
				b. 0.22-.85 ppm TCDD in soils.	Possible dermal, inhalation, ingestion.	b. 2-three boys
				c. No data		c. None reported
				d. 0.12ppm TCDD in arena soil. 0.61ppm TCDD in road soil.	Possible dermal, ingestion.	d. None reported

with 2,3,7,8,-TCDD or other Polychlorinated Dibenzo Dioxins (PCDDs)

CONTAMINANT	CONTAMINANT LEVELS	EXPOSURE ROUTE	# PERSONS EXPOSED	SYMPTOMS
			# PERSONS AFFECTED	
			1-adult, male	Severe headaches, nausea
			1-adult, female	Severe headaches, nausea, diarrhea
			1-adult male, (both at arena A & C collecting soil samples)	Chloracne
b.	0.22-.85 ppm TCDD in soils.	Possible dermal, inhalation, ingestion.	b. 2-three yr. old boys	Chloracne
c.	No data		c. None reported	
d.	0.12ppm TCDD in arena soil. 0.61ppm TCDD in road soil.	Possible dermal, ingestion.	d. None reported	

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# ANIMALS EXPOSED	SYMPTOMS	REFERENCES
# ANIMALS AFFECTED		
25 horses exposed	12 deaths; severe emaciation, toxic hepatitis, gastric ulcers, splenic atrophy, skin lesions.	28,39,68
37 horses exposed	7 deaths, 30 illnesses; conjunctivitis, skin ulcers, anorexia, weight loss, alopecia.	39,68
70 chickens	Death	28,39,68

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TABLE 3: Summary of Incidents Resulting in Possible Environmental Contamination with 2,3,7,8-TCDD or other Polychlorinated Dibenzo Dioxins (PCDDs)

DATE OF INCIDENT	LOCATION	INCIDENT RESULTING IN ENVIRONMENTAL CONTAMINATION	SOURCE OF CONTAMINANT	CONTAMINANT LEVELS	EXPOSURE ROUTE	# PERSONS
						# PERSONS
1972	France	Exposure to baby powder containing 6% hexachlorophene.	Hexachlorophene*	6% hexachlorophene in baby powder	Possible dermal, inhalation.	145 41
1972-1977	Alsea, Oregon/ United States	Forestry management by spraying of defoliant.	2,4,5-T	N. A.		13 cases r
1975	Canada	Pentachlorophenol release into rivers: • Overflowing of PCP dip tank for lumber treatment • Spraying of telephone poles.	PCP PCP	Levels not known; PCP contains hexa, hepta, octa, chlorodibenzo-dioxins.	Ingestion Ingestion	
1976	Varmland/ Sweden	Forestry management by spraying of defoliant.	2,4,5-T	N. A.		

*There are no published references that report positive analysis of dioxin in hexachlorophene, although it is believed to be there in concentrations <15ppb.

Not reported

ed Dioxins (PCDDs)

EXPOSURE ROUTE	# PERSONS EXPOSED	SYMPTOMS	# ANIMALS EXPOSED	SYMPTOMS	REFERENCES
	# PERSONS AFFECTED		# ANIMALS AFFECTED		
Possible dermal, inhalation.	145 41	Illnesses Deaths	—	—	21,28
	13 cases reported	Alleged increased rate of spontaneous abortion. Study showed no demonstrated increase in abortions for the area and no conclusive evidence linked to 2,4,5-T.	—	—	68
Ingestion					
Ingestion					
			15 massive fish kills	Death	15
			5000 coho salmon	Death	15
	Not reported	Alleged increase in perinatal death and birth defects (spina bifida). Study showed no such increase or correlation with 2,4,5-T use.	—	—	68

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C23842

ted Dibenzo Dioxins (PCDDs)

EXPOSURE ROUTE	# PERSONS EXPOSED	SYMPTOMS	# ANIMALS EXPOSED	SYMPTOMS	REFERENCES
	# PERSONS AFFECTED		# ANIMALS AFFECTED		
Possible dermal	4 reported cases in children	Death	—	—	21
Possible dermal	65 children NOTE: Out of 68 children born to unexposed mothers, 1 malformation occurred.	11 malformations, 5 were severe.	—	—	21
ed Possible dermal, ingestion, inhala-	Many exposed, number affected not given; 263 families re-located.	N.A.	—	—	21,68
Possible dermal and inhalation of contaminated dusts.	2 affected	1-chloracne; both had low levels of 2,3,7,8-TCDD in their blood.	—	—	21
—	None reported	None reported	None reported	None reported	68

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TABLE 3: Summary of Incidents Resulting in Possible Environmental Contamination with 2,3,7,8-TCDD or other Polychlorinated Dibenzo Dioxins (PCDDs)

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						# PERSONS AFFECTED		# ANIMALS
1976	N. A.	Exposure to detergent containing 3% hexachlorophene.	Hexachlorophene*	3% hexachlorophene in detergent.	Possible dermal	4 reported cases in children	Death	—
1978 reported	Sweden	Nurses working in hospitals during pregnancy; use of hexachlorophene.	Hexachlorophene* Other exposures not mentioned.	N. A.	Possible dermal	65 children	11 malformations, 5 were severe. NOTE: Out of 68 children born to unexposed mothers, 1 malformation occurred.	—
1978 reported	Love Canal, N.Y./ United States	Hazardous waste landfill violated resulting in chemical leaks. (Hooker Chemical Co. buried TCP, 2,4,5-T wastes ~200 tons between 1942-1952).	2,4,5-T; TCP; positive analysis for TCDD	Levels in water reported for various areas.	Possible dermal, ingestion, inhalation	Many exposed, number affected not given; 263 families relocated.	N.A.	—
1979	Sturgeon, Missouri/ States	Railway accident resulting in chemical spill.	"o-chlorophenol contaminated with <0.1% TCP, and 37ppb 2,3,7,8-TCDD.	~37ppb 2,3,7,8-TCDD.	Possible dermal and inhalation of contaminated dusts.	2 affected	1-chloracne; both had low levels of 2,3,7,8-TCDD in their blood.	—
1979	Montague, Michigan/ United States	Hazardous waste dump site (Hooker Chemical Co.).	Waste residues.	760ppb TCDD	—	None reported	None reported	None reported

*There are no published references that report positive analysis of dioxin in hexachlorophene, although it is believed to be there in concentrations <15ppb.

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						# PERSONS AFFECTED	
1979	Jacksonville, Arkansas/ United States	Vertac Inc.-chemical dump site on plant premises containing 2,4,5-T residues contaminated with 110ppm TCDD: leaking into rivers.	50 lbs TCDD buried on site.	82ppt TCDD found in fish downstream of plant: water effluent 0.2-0.6ppb TCDD. Other data are available.		Only reports are of plant personnel. See industrial accidents.	None reported
1981	Binghamton, N.Y./ United States	PCB transformer fire in an office building.	PCB; 2,3,7,8-TCDD	3-10ppm PCB; 3ppm 2,3,7,8-TCDD in soot		160 exposed upon return to work after clean up.	None reported

TABLE 3: Summary of Incidents Resulting in Possible Environmental Contamination with 2,3,7,8-TCDD or other Polychlorinated Dibenzo Dioxins (PCDDs)

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						# PERSONS AFFECTED	
1979	Jacksonville, Arkansas/ United States	Vertac Inc.-chemical dump site on plant premises containing 2,4,5-T residues contaminated with 110ppm TCDD: leaking into rivers.	50 lbs TCDD buried on site.	82ppt TCDD found in fish downstream of plant: water effluent 0.2-0.6ppb TCDD. Other data are available.		Only reports are of plant personnel. See industrial accidents.	None reported
1981	Binghamton, N.Y./ United States	PCB transformer fire in an office building.	PCB; 2,3,7,8-TCDD	3-10ppm PCB; 3ppm 2,3,7,8-TCDD in soot		160 exposed upon return to work after clean up.	None reported