

PROGRESS OF THE NIOSH CROSS-SECTIONAL MEDICAL STUDY OF WORKERS
OCCUPATIONALLY EXPOSED TO CHEMICALS CONTAMINATED WITH 2,3,7,8-TCDD

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ABSTRACT

In 1987-1988, the National Institute for Occupational Safety and Health conducted a cross-sectional epidemiologic study of 400 living individuals who worked at two U.S. facilities which manufactured chemicals contaminated with 2,3,7,8-TCDD. For comparison, unexposed referents matched to each worker by age, race, sex and current resident community of the worker were studied. The study was designed to evaluate those health outcomes previously reported to be associated with exposure to 2,3,7,8-TCDD contaminants, including dermatologic, neurologic, hepatic, immunologic, and psychological disorders. Participation involved completion of an occupational history questionnaire and a two-day medical exam. The following is a preliminary report of the study design, referent selection and subject participation rates.

KEYWORDS

Cross-sectional morbidity study, occupational exposure, 2,3,7,8-TCDD

INTRODUCTION

In 1987-1988, the National Institute for Occupational Safety and Health (NIOSH) conducted a cross-sectional epidemiologic study of 400 living workers employed at two U.S. facilities in the manufacture of chemicals contaminated with 2,3,7,8-TCDD. The study was designed to evaluate those health outcomes previously reported to be associated with exposure to materials contaminated with 2,3,7,8-TCDD, as described in Table 1.

Table 1. Outcomes associated with exposure to materials contaminated with 2,3,7,8-TCDD

Neurologic:	Peripheral neuropathies; neurobehavioral effects
Dermatologic:	Chloracne; pigmentary changes; skin cancer
Hepatic:	Enzyme changes; porphyria
Cardiovascular:	Angina; myocardial infarction
Gastrointestinal:	Ulcers
Metabolic:	Lipid changes; diabetes
Immunologic:	Lymphocyte cell types and function
Reproductive:	Fetal loss; reduced fertility; major malformations

METHODS

Workers included in the study were employed at one of two plants located in either Newark, New Jersey (NJ) or Verona, Missouri (MO) (Table 2). The plant located in New Jersey manufactured trichlorophenol (TCP) and 2,4,5 trichlorophenoxyacetic acid (2,4,5-T) from 1951 - 1969. All workers ever employed at the plant (N = 490) were eligible for study. The plant located in Missouri, produced TCP, 2,4,5-T and hexachlorophene for approximately 22 months from 1968 - 1972. Workers assigned to the production or maintenance of these processes, and a few laboratory workers who were involved in the testing of the contaminated products were eligible for study (N = 96).

For comparison, unexposed referents were matched to each worker by age (\pm 5 years), race, sex, and current resident community of the worker. The referent could not have been employed where chlorophenols or phenoxyherbicides were produced. Comparison of past and current health status of the exposed workers to the unexposed referents will determine whether there are persistent health effects associated with exposure to products contaminated with 2,3,7,8-tetrachlorodibenzo-p-dioxin.

Table 2. Description of study population

Location of Plant	Chemicals Produced	Period of Production	Individuals Eligible for Study	# Eligible
NJ	TCP & 2,4,5-T	1951-1969	-All employees ever employed at plant	490
MO	TCP & 2,4,5-T	1968-1969	-Production & maintenance workers assigned to process -Laboratory workers who handled contaminated materials	96
	TCP & Hexachlorophene	1970-1972	-Production & maintenance workers assigned to process	
TOTAL				586

Selection of worker-matched referents was based on a procedure requiring neighborhood door-to-door solicitation. Starting at the northeast corner of the census tract where a worker lived, trained interviewers enumerated every residence on every street in the census block, screening households for potential referents who matched the worker on the basis of age, sex and race. Each residence in the census block was screened door-to-door in a counter-clockwise pattern. As potential referents were identified, they were assigned a number from 1-6, based on the order in which they were identified. The census tract was screened until a matched referent agreed to participate. If no matched referent was identified in the census tract where the worker lived or if no matched referent in that census tract agreed to participate, the census tract located geographically to the southeast of the worker's census tract was screened for matching referents. Screening continued in contiguous census tracts until a suitable match was selected. Selection was based on the matching referent's numerical position in a preassigned random sequence. For example, if the random sequence was "3 4 1 2 6 5", then the third person who was identified as a match was the first person invited to participate. If referent #3 refused, referent #4 was then invited, and so forth, until a referent in the sequence agreed to participate in the study.

Participation involved completion of an interviewer-administered questionnaire detailing lifetime employment history, occupational exposure to toxic chemicals, hobbies, personal habits, time in Vietnam, time in agriculture, residential history, hospitalizations and

medication history (Table 3). In most cases, the interview was conducted at participants homes and took approximately 2 - 2.5 hours to complete.

Table 3. Elements of the demographic and occupational interview

- * Occupational History for Missouri and New Jersey plants
- * Hospitalizations and Medication History
- * Other Exposures:
 - Job
 - Hobbies, farm activities, time in Vietnam
 - Sunlight history
- * Demographics:
 - Smoking history
 - Alcohol consumption
 - Age
 - Education
 - Income
 - Religion
 - Residential history

Each subject also took part in a comprehensive two-day physical examination, including dermatologic, neurologic, neurobehavioral and neurophysiological evaluations, blood and urine chemistries, measurement of serum levels of 2,3,7,8-TCDD, complete medical history and other health appraisals. The examinations were conducted at the Lovelace Medical Foundation in Albuquerque, New Mexico, U.S.A.

Table 4. Components of the medical examination

- * Clinical Examinations:
 - General Physical
 - Dermatologic
 - Neurologic
- * Clinical Chemistries
- * Serum 2,3,7,8-TCDD Levels
- * Electrophysiologic Tests + Quantitative Sensory Tests
- * EKG, Vision, Hearing, Chest X-Ray, Pulmonary Function Tests
- * Peripheral Vascular Exam
- * Blood Pressure, Pulse, Respiration, Height, Weight
- * Medical History Interview
- * Psychological and Neurobehavioral Assessment
- * Reproductive History

PARTICIPATION RATES

Of the 586 workers who were eligible for the study, 24% were deceased and 7% were unable to be located, leaving 400 workers (68% of the cohort) who were alive and located (Table 5). All 400 workers were invited to participate in the study; 90% were interviewed and 70% were examined. Of the 90% interviewed, 1% of the respondents were the next-of-kin of disabled workers who were unable to participate in the medical examination. Proxy interviews were conducted by administering the demographic and occupational history questionnaire to next-of-kin of disabled workers.

Table 5. Worker participation

<u>Status</u>	<u>N</u>	<u>%</u>
Total	586	100%
Deceased	143	24.4
Unlocatable	43	7.3
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Alive + Located	400	68.3
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Interviewed	357	89.2
Proxy Interviewed	3	.8
Examined	281	70.3

Using the systematic random sampling procedure, 913 individuals meeting the matching criteria were invited to participate in the study as referents. More than half of the individuals who were first or second in the sequence agreed to participate in the study (Table 6).

Table 6. Participation rate based on solicitation sequence

<u>Position in Sequence</u>	<u>Total (N)</u>	<u>%</u>	<u>Cumulative %</u>
1	151	46.4	46.4
2	50	15.4	61.8
3	43	13.2	75.1
4	27	8.3	83.4
5	22	6.8	90.2
6+	32	9.8	100

Three-hundred-twenty-five (325) referents were administered the demographic and occupational interview. Of those interviewed, 80% participated in the exam (Table 7). Of the worker-referent pairs interviewed, both members of the pair were examined in 76% of the cases.

Table 7. Referent participation

<u>Referents</u>	<u>N</u>	<u>% Interviewed</u>
Interviewed	325	100%
Examined	260	80

A preliminary review of the demographic characteristics of the study population indicated that the workers and referents are similar for the socioeconomic factors illustrated in Table 8.

Table 8. Description of interviewed worker and referents

	<u>New Jersey</u>				<u>Missouri</u>			
	<u>Workers</u>		<u>Referents</u>		<u>Workers</u>		<u>Referents</u>	
	<u>N</u>	<u>(%)</u>	<u>N</u>	<u>(%)</u>	<u>N</u>	<u>(%)</u>	<u>N</u>	<u>(%)</u>
Demographics								
Race (% White)	242	(86)	215	(85)	75	(100)	71	(97)
Race (% Non-White)	40	(14)	37	(15)	0		2	(3)
Sex (% Male)	262	(93)	234	(93)	75	(100)	73	(100)
Sex (% Female)	20	(7)	18	(7)	0		0	
Mean Age	58		59		49		48	
Mean Days	1216		NA		714		NA	
Employed at NJ or MO Plant								
Education	<u>N</u>	<u>%</u>	<u>N</u>	<u>%</u>	<u>N</u>	<u>%</u>	<u>N</u>	<u>%</u>
1 - 8 Years	32	11	30	12	12	16	6	8
9 - 12 Years	125	44	117	46	37	50	29	40
Technical Trng	24	9	15	6	7	9	11	15
College & Postgraduate (Total)	<u>101</u>	<u>36</u>	<u>90</u>	<u>36</u>	<u>19</u>	<u>25</u>	<u>27</u>	<u>37</u>
	282		252		75		73	
Income	<u>N</u>	<u>%</u>	<u>N</u>	<u>%</u>	<u>N</u>	<u>%</u>	<u>N</u>	<u>%</u>
under \$10,000	30	11	27	11	5	7	5	7
\$10,000-\$29,999	97	34	89	35	33	44	32	44
\$30,000-\$49,999	78	28	69	27	27	36	19	26
\$50,000 +	69	24	62	25	9	12	6	8
Refused	8	3	5	2	1	1	11	15
(Total)	<u>282</u>		<u>252</u>		<u>75</u>		<u>73</u>	

NA = Not Applicable

DISCUSSION

This paper presents a description of the participation rates for workers and referents and illustrates that they are comparable for measured socioeconomic factors. NIOSH researchers are currently analyzing the data obtained in the questionnaires and medical examinations. Future analysis will assess the relationship of current and past health status of exposed workers and their histories of employment in the manufacture of chemicals contaminated with 2,3,7,8-TCDD, as well as the current serum levels of 2,3,7,8-TCDD.