U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
CENTER FOR DISEASE CONTROL
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
CINCINNATI, OHIO 45226

SUPPLEMENT TO
HEALTH HAZARD EVALUATION DETERMINATION
COMPOSITE REPORT ON THIRAM FOR HHE 75-140-357

WEBFOOT REFORESTATION
PLEASANT HILL, OREGON

DECEMBER, 1976

I. INTRODUCTION

The National Institute for Occupational Safety and Health received the request for a hazard evaluation from the owner of Webfoot Reforestation. This Supplement to the Composite Report on Thiram contains specific data on work process, study conduct, and results for the Webfoot Reforestation. A discussion of the findings and the conclusions drawn from the study as a whole are contained in the Composite Report.

II. HEALTH HAZARD EVALUATION

A. Description of Process

Webfoot Reforestation plants reforestation trees under contract to various land holders such as lumber firms, the U.S. Forest Service, etc. During this survey they were planting bare root trees for the Weyerhaeuser Company near Coos Bay, Oregon and Aberdeen, Washington.

The tree planters working for this contractor usually stay in motels. They average a little better than 1000 trees per day per man. The work cycle often involves 10 days on and 4 days off.

B. Study Progress and Design

1. General

The medical-environmental evaluations were conducted during two separate time periods. The first was conducted near Coos Bay, Oregon on January 27-28, 1976. The trees being planted were 2-0 Douglas Fir, which were treated with latex, but an inert material was used in lieu of the Thiram.

This group served as one of two blind controls to determine if the substances applied to the trees, other than Thiram, would give results, either physically or analytically on the blood samples and air samples similar to that of Thiram.

On January 28, 1976, the day environmental samples were obtained, the weather was clear and sunny. The temperature was 45°F at 8:00 a.m. and at 1:30 p.m. it was 60°F in the shade where they were planting. Just into the workday most of the planters removed their jackets and some rolled up their sleeves. There was no water available for the men to wash their hands before eating or smoking.

Medical interviews were conducted at the motel on the evenings of January 27-28. Pre-exposure bloods were obtained on January 28 before going to the field. Post-exposure bloods were drawn the same evening after return from the field for a one day exposure.

The second evaluation was conducted near Aberdeen, Washington, on March 23-25, 1976. The trees being planted were 2-1 Douglas Fir which had been treated with the Thiram-Latex mixture. On March 23, the weather was overcast 40-45°F and at noon it started to rain. At this point the samples were stopped. During the morning, the planters all wore jackets.

On March 25, the day environmental samples were obtained, the weather was most cloudy, 40-50°F and it rained about 30 minutes during the sample period. There was no wash water available for the men to wash their hands before eating or smoking.

Seven planters had been seen while planting "snow" trees and so were not reinterviewed. Two workers were interviewed at the motel on the evening of March 25. Pre-exposure bloods were obtained on March 23 before going to the field. Post-exposure bloods were drawn on March 25 after returning from the field. On March 24, 1976, planting was suspended due to high winds. The planters had a free day in town. These planters had 2 days worth of exposure over 3 days.

During these surveys, the employees stated that the amount of Thiram on the trees varied greatly from batch to batch with some trees looking like "flocked" Christmas trees.

2. Environmental Sampling

For this evaluation, nine environmental air samples were collected in the breathing zone of the planters on January 28, 1976, during the planting of "snow" treated trees and seventeen on March 23-25, 1976, during the planting of Thiram treated trees.

Two trees were collected from the lot of "snow" trees being planted in order to determine the concentration of Thiram per gram of trees (above ground portion only). Two trees were similarly collected from the lot of Thiram treated trees being planted. In addition, 2 cigarettes were collected from the planters on a day they were planting Thiram treated trees, after they had simulated smoking them to determine if Thiram particles were being transferred to the cigarettes during smoking.

3. Medical Sample

Two crews of about 10 men each were planting at the time the "snow" trees were being planted. Twelve participated in the study. One crew of 10 was available at the time the Thiram treated trees were being planted. Nine participated in the study. Of these, seven had been seen on the previous visit so the detailed questionnaire was not repeated. All men had had experience with Thiram treated trees.

All planters were men. When seen planting "snow" trees the 12 men had a mean age of 34.8, a median age of 33.5 and a range from 20 to 51. When seen planting Thiram treated trees the 9 men had a mean age of 37.9, a median age of 42 and a range from 20 to 58.

C. Evaluation Results

1. Environmental (Tables III and IV taken from Composite Report)

As shown in Table III (Company Number 4), none of the nine breathing zone air samples collected on January 28, 1976, as part of the blind controls (snow treated trees), contained detectable amounts of Thiram or other substances present on the trees that would give a false indication that Thiram was present. Three of the seventeen (17.6%) breathing zone air samples collected on March 23 and 25, 1976, during the planting of Thiram treated trees contained more than the detectable amounts of 5.0 micrograms per filter. The three samples contained 0.021, 0.021, and 0.018 mg of Thiram per cubic meter of air.

These concentrations are approximately 1/250th of the existing Federal standards of 5 mg/m^3 or about 1/7th of that amount needed to achieve a daily intake of 2 mg per day through inhalation below which the World Health Organization considers a safe exposure.

Results of tree samples taken (Table IV) show that there were negligable readings for Thiram on the trees (#15, 16) used for the blind controls and 3000 to 2800 micrograms (ug) of Thiram per gram (gm) of tree on the trees planted on March 23 and 25, 1976 (#17, 18). (For all trees sampled during the study, the amount of Thiram on the trees ranged from 89 ug Thiram/gm of tree to 8400 ug/gm).

Neither cigarette showed a measurable amount of Thiram.

2. Medical

Table VIII F shows symptoms developing over the study period among these tree planters, both while planting "snow" trees and while planting Thiram treated trees. Table IX F gives symptoms reported on detailed questioning.

Eleven (11) seasoned planters had their blood pressure and pulse taken during a period while they were planting "snow" trees. The means and 95% confidence intervals of the mean were: systolic 116.0 ± 10.4 mm Hg; diastolic 66.9 ± 8.3 mm Hg; pulse 72.0 ± 7.6 /min. Two seasoned planters were examined during a period when they were planting Thiram treated trees. Their blood pressures and pulses happened to be identical with a systolic pressure of 130 mm Hg, and diastolic pressure of 60 mm Hg, and a pulse of 76/min. Blood pressures below 140 mm Hg systolic and 90 mm Hg diastolic are considered normal. Younger persons would expect to be lower than older adults. There is no defined lower limit of normal in otherwise healthy individuals.

None of the pre-test bloods had measurable levels of Thiram. Ten planters had been planting "snow" trees in the few weeks immediately preceding the test and nine planters had been planting Thiram treated trees during the few weeks immediately preceding the test. The mean Dopamine beta-Hydroxylase levels were 20.2 ± 6.4 units/liter and 24.4 ± 3.5 units/liter respectively.

III. AUTHORSHIP AND ACKNOWLEDGMENTS

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TABLE III

RESULTS OF PERSONAL BREATHING ZONE AIR SAMPLES COLLECTED DURING TREE PLANTING OPERATIONS
THIRAM STUDY, REFORESTATION, PACIFIC NORTHWEST

COMPANY IDENTIFICATION NUMBER	TYPE OF TREES PLANTED	TREE TREATMENT	NUMBER POSITIVE* FOR THIRAM DETECTION	NUMBER NEGATIVE FOR THIRAM DETECTION	THIRAM CONCENTRATION mg/m^3	TOTAL NUMBER SAMPLES
3	Bare Root	"Snow"**	0	10	10 < 0.02	10
	Bare Root	Thiram	4	6	0.029 0.028 0.030 0.157 6 < 0.02	10
4	Bare Root	"Snow"	0	9	9 < 0.01	9
	Bare Root	Thiram	3	14	0.021 0.021 0.018 14 < 0.02	17
5	Bare Root	Thiram	1	5	0.021 5 < 0.02	6
6	Bare Root	Thiram	0	3	3 < 0.02	3
	Plugs	Thiram	5	10	0.012 0.020 0.021 0.011 0.019 10 < 0.02	15
7	Bare Root	None (no Thiram or Snow)	0	7	7 < 0.02	7

* Minimum detectable amount of Thiram was 5.0 micrograms per filter.
** Snow - a substance similar in appearance to Thiram.

TABLE IV

THIRAM CONCENTRATION ON TREES
THIRAM STUDY, REFORESTATION, PACIFIC NORTHWEST

SAMPLE NUMBER	HOW TREATED	TYPE AND SIZE OF TREE	RESULTS ug THIRAM/gm TREE*	WEIGHT OF TREE gm*
Tree 1	No Thiram	Plug Douglas Fir	0	2.0**
Tree 2	No Thiram	Plug Douglas Fir	0	2.4
Tree 3	Thiram	Plug Douglas Fir	1800	2.0**
Tree 4	Thiram	Plug Douglas Fir	1800	2.0**
Tree 5	"Snow"***	2-0 Douglas Fir	4	12.0**
Tree 6	"Snow"	2-0 Douglas Fir	6	12.0**
Tree 7	Thiram	2-0 Douglas Fir	105	13.8
Tree 8	Thiram	2-0 Douglas Fir	97	16.7
Tree 9	Thiram	2-1 Douglas Fir	89	19.8
Tree 10	Thiram	2-1 Douglas Fir	122	14.1
Tree 11	No Thiram	2-1 Douglas Fir	1	27.4
Tree 12	No Thiram	2-1 Douglas Fir	1	21.5
Tree 13	Thiram	2-0 Hemlock	707	4.2
Tree 14	Thiram	2-0 Hemlock	628	5.0

* Above Ground Portion of Tree

** Estimated Weight of Tree (Laboratory only reported total weight of Thiram found on these samples).

*** Snow - A substance similar in appearance to Thiram

TABLE IV, cont.

THIRAM CONCENTRATION ON TREES

THIRAM STUDY, REFORESTATION, PACIFIC NORTHWEST

SAMPLE NUMBER	HOW TREATED	TYPE AND SIZE OF TREE	RESULTS ug THIRAM/gm TREE*	WEIGHT OF TREE - gm*
Tree 15	"Snow"	2-0 Douglas Fir	7	6.8
Tree 16	"Snow"	2-0 Douglas Fir	1	8.5
Tree 17	Thiram	2-1 Douglas Fir	3000	50.1
Tree 18	Thiram	2-1 Douglas Fir	2800	15.9
Tree 19	Thiram	1-1 Douglas Fir	3700	15.9
Tree 20	Thiram	1-1 Douglas Fir	4300	25.2
Tree 21	Thiram	2-0 Douglas Fir	3100	12.3
Tree 22	Thiram	2-0 Douglas Fir	3000	13.5
Tree 23	Thiram	2-1 Hemlock	400	18.1
Tree 24	Thiram	2-1 Hemlock	700	7.6
Tree 25	Thiram	Plug Douglas Fir	8400	3.1
Tree 26	Thiram	Plug Douglas Fir	6100	3.9

* Above ground portion of tree

TABLE VIII F

SYMPTOMATOLOGY BY EXPOSURE GROUP - TREE PLANTERS
THIRAM STUDY, WEBFOOT REFORESTATION, PLEASANT HILL, OREGON
HHE 75-140 January 27 - March 25, 1976

Symptoms Developing Over the Study Period

SYMPTOMS	THIRAM TREES	Percent	"SNOW" TREES	Percent
Number of Workers	9		9	
Eye Complaints	5	56	0	0
Nasal Irritation	6	67	2	22
Throat Irritation	2	22	7	78
Cough	4	44	3	33
Chest Discomfort or Shortness of Breath	3	33	2	22
Skin Problems	2	22	0	0
Total with Local Symptoms Likely to be Due to Thiram in the Planters Planting Thiram Trees	8	89	7	78
Headaches	3	33	3	33
Dizziness or Lightheadedness	3	33	1	11
Fatigue	0	0	0	0
Nausea or Upset Stomach	4	44	1	11
Diarrhea	0	0	0	0
Alcohol Intolerance	0 of 5		0 of 0	
Total with Systemic Symptoms Likely to be Due to Thiram in the Planters Planting Thiram Trees	6	67	3	33
Kidney Complaints	3	33	0	0
Total with No Complaints	1	11	2	22

TABLE IX F

SYMPTOMATOLOGY BY EXPOSURE GROUP - TREE PLANTERS
THIRAM STUDY, WEBFOOT REFORESTATION, PLEASANT HILL, OREGON
HHE 75-140 January 27 - March 25, 1976

Symptoms by History

SYMPTOMS	TOTAL	PERCENT
Number of Workers	14	
Self Health Assessment		
Good	12	86
Fair	2	14
Eye Complaints	10	71
Nasal Irritation	5	36
Throat Irritation	6	43
Cough	0	0
Chest Discomfort of Shortness of Breath	0	0
Skin Problems	6	43
Total With Local Symptoms Likely to be Due to Thiram	12	86
Headaches	4(1)*	29
Dizziness or Lightheadedness	1	7
Increased Problem with Prolonged Work Weed	1	7
Nausea or Supet Stomach	7(1)	50
Diarrhea	5	36
Alcohol Intolerance	3(1) of 12	25
Total with Systemic Symptoms Likely to be Due to Thiram	10(1)	71
Total Other Problems Probably or Definitely Not Related to Thiram	2	14
Total With No Health Complaints	0	0

*Nature of the problem was insufficiently clear to definitely categorize it. These are not included in the percentages. Workers with the questionable complaints were excluded from the "No health complaint" group.