

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

INTERIM REPORT #1
HEALTH HAZARD EVALUATION PROJECT NO.
HE 79-109

KELLY-SPRINGFIELD TIRE COMPANY
CUMBERLAND, MARYLAND

September 19, 1979

I. INTRODUCTION/BACKGROUND STATEMENT OF REQUEST

On June 8, 1979 the National Institute for Occupational Safety and Health (NIOSH) received a request from the United Rubber Workers Association, Local 26, for a health hazard evaluation of the Kelly-Springfield Tire Company in Cumberland, Maryland. The alleged health hazard was employee exposure to n-nitrosodiphenylamine (Tardex), a chemical retarding agent used in the manufacture of truck tires.

According to a recent National Cancer Institute study, n-nitrosodiphenylamine has been found to cause cancer in rats. The requester wanted to know if this same compound is causing cancer among the tire workers.

II. ACTIONS TAKEN TO DATE

On July 31, and August 1, 1979, an initial conference was held with Kelly-Springfield management personnel, the NIOSH project officer, and the MOSHA case officer, in which the nature and scope of the health hazard program was explained. A separate conference was held with a union representative explaining what NIOSH intended to do during the initial survey.

After the opening conference the NIOSH project officer, MOSHA case officer, Kelly-Springfield management representative, and a union representative conducted a walk-through survey of tire manufacturing operations. Special emphasis was placed on observing workers weigh-out n-nitrosodiphenylamine (Tardex), for batch mixing in the Bambury machine. Observation of work practices, engineering controls, and protective clothing, was noted during the weigh-up operation.

Environmental Sampling

Twelve aerometric process samples were taken during the initial survey. Specially designed thmosorb/N sampling cartridges provided by the New England Institute for Life Sciences (NEILS) were used to detect the presence of N-nitroso compounds. Particular emphasis was placed on the analysis of n-nitrosodiphenylamine. Air samples were taken during the manufacture of tires only when n-nitrosodiphenylamine was added to the batch rubber.

The sampling strategy used in the initial survey was to set sampling trains and thermosorb cartridges as close to all hot processes as possible. If volatile n-nitrosamines were present we would find these contaminants at their source and at peak concentrations. Areas chosen for sampling were: the #8 Bambury machine (upper and lower hopper), the 8/10 mills (#5, 6, & 7), the tire presses (#708, 722, & 736), 8/10 tuber (upper line at head, and lower), and the train calenders (#20 & 21).

The analysis of samples was done by high-performance liquid chromatography and thermal energy analysis (HPLC-TEA). The New England Institute for Life Sciences performed the analysis. The operation of HPLC-TEA has been discribed by Fine et al.

III. FINDINGS TO DATE

The amount of nitrosamines found during the initial survey are in Tables 1 and 2. N-nitrosodiphenylamine was not found in any of the process samples. However, all of the 12 air samples were found to contain N-nitrosodimethylamine (NDMA) and N-nitrosomorpholine (NMOR). For NDMA the levels varied from .05 ug/m³ at the #8 Bambury to 4.1 ug/m³ at the head of the tuber. For NMOR the levels varied from a low of 1.4 ug/m³ at the #8 Bambury to a high of about 240 ug/m³ at the train calender (mill #20). This level of NMOR, which was found near the train calender, is ten times higher than any level of NMOR that has previously been reported in any rubber company. The two samples taken near the train calender (#9 and #10) were also found to contain N-nitrosopyrrolidine.

IV. FUTURE ACTION

Based upon the environmental findings, NIOSH will be conducting a follow-up survey to thoroughly evaluate worker exposure to nitrosamines. The NIOSH medical officer will be conducting a medical and epidemiological survey of workers exposed to nitrosamines. Enviromental sampling will be more extensive and include general area, and breathing zone air samples. Biological sampling of "target group" workers is anticipated, by obtaining blood and/or urine samples. A control technology assessment of engineering controls at the Kelly-Springfield plant will be conducted. The follow-up survey will be conducted after a medical and sampling protocol has been developed.

V. RECOMMENDATIONS

1. The Kelly-Springfield tire company should immediately assess the effectiveness of present engineering controls throughout the tire plant, especially in hot process areas such as milling and calendering.
2. Areas deficient in ventilation of air contaminants should be evaluated as soon as possible for installation or modification of air exhaust systems.
3. The separate handling of Tardex and work practices appeared adequate in controlling exposure to Tardex dust. However, additional local exhaust is recommended around the Tardex drum, to capture respirable dust that may become airborne during the transfer from the drum to the weigh scale.
4. Disposable gloves impervious or resistant to nitrosamines are recommended for the worker handling Tardex.

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HE 79-109

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Table I. Amount of Nitrosamines Found on 1. h Sample

Sample #	Location	NDMA ($\mu\text{g}/\text{sample}$)		NMOR ($\mu\text{g}/\text{sample}$)	
		GC-TEA	LC-TEA	GC-TEA	LC-TEA
1	8/10 Mill (#5)	0.24 μg	0.26	2.0	2.1
2	Bambury #8 (lower hopper area) out	0.01	0.01	0.32	0.29
3	Press (Autoform 708)	0.17	0.18	6.3	5.9
4	Bambury #8 (upper hopper area) in	0.01	0.01	0.23	0.23
5	Tuber (lower line)	0.10	0.09	1.6	1.3
6	Press (Autoform 736)	0.06	0.05	1.6	1.3
7	8/10 Mill (#6)	0.12	0.11	1.6	1.3
8	Press (Autoform 722)	0.12	0.15	3.7	3.9
9	Train calendar (Mill # 20)	0.51 0.88 (NPYR)	- 0.91 (NPYR)	66.1	51.0
10	Train calendar (Mill #21)	0.27 0.29 (NPYR)	0.31 0.29 (NPYR)	17.2	17.5
11	8/10 Tuber (upper line at head)	1.3	1.4	10.3	9.3
12	8/10 Mill (#7)	0.17	0.15	1.1	0.88

* An interfering peak prevented quantitation of NDMA in this sample on HPLC

Table II. Calculated Concentrations of Air-borne Nitrosamines

Sample #	Location	NDMA $\mu\text{g}/\text{m}^3$		NMOR $\mu\text{g}/\text{m}^3$	
		GC-TEA	HPLC-TEA	GC-TEA	LC-TEA
1	8/10 Mill (#5)	0.60	0.65	5.0	5.2
2	Bambury #8 (lower hopper area) out	0.08	0.07	2.1	1.9
3	Press (Autoform 708)	0.18	0.20	6.8	6.4
4	Bambury #8 (upper hopper area) in	0.05	0.07	1.4	1.4
5	Tuber (lower line)	0.30	0.28	4.9	4.0
6	Press (Autoform 736)	0.06	0.05	1.7	1.4
7	8/10 Mill (#6)	0.28	0.26	3.6	3.0
8	Press (Autoform 722)	0.15	0.15	3.9	4.1
9	Train calendar (Mill # 20)	1.9 3.3 (NPYR)	* 3.4 (NPYR)	248	191
10	Train calendar (Mill #21)	1.0 1.1 (NPYR)	1.1 1.1 (NPYR)	64	66
11	8/10 Tuber (upper line at head)	4.1	4.4	32	29
12	8/10 Mill (#7)	0.39	0.34	2.4	2.0

* An interfering peak prevented quantitation of NDMA in this sample on HPLC

TABLE II

Expected Cancers of the Lung and Bronchus

No Minimum Latency

B.F. Goodrich
Milling and Tuber Area
Woodburn, Indiana
HETA 85-003

Age	Person-Years at Risk	Incidence/100,000	Expected Cases
15-19 (Males)	37	0.0	0.000
20-24	313	0.2	0.001
25-29	602	0.6	0.004
30-34	671	2.6	0.017
35-39	638	7.4	0.047
40-44	510	22.8	0.116
45-49	232	58.3	0.135
50-54	88	106.8	0.094
55-59	28	181.7	0.050
60-64	10	284.2	<u>0.027</u>
			= 0.491
15-19 (Females)	4	0.3	0.000
20-24	32	0.2	0.000
25-29	50	0.7	0.000
30-34	42	2.0	0.001
35-39	33	5.6	0.002
40-44	11	14.5	<u>0.002</u>
			= 0.005

Total Number of Expected Cases = 0.496

Minimum Number of Cases Necessary for a Statistically Significant Excess* = 3

Number of Cases Verified = 5

Standardized Morbidity Ratio (SMR) = 10.08

95% Confidence Interval for the SMR: 3.25 - 23.52

* Upper boundary of the 95% Confidence Interval for the Poisson Distribution.