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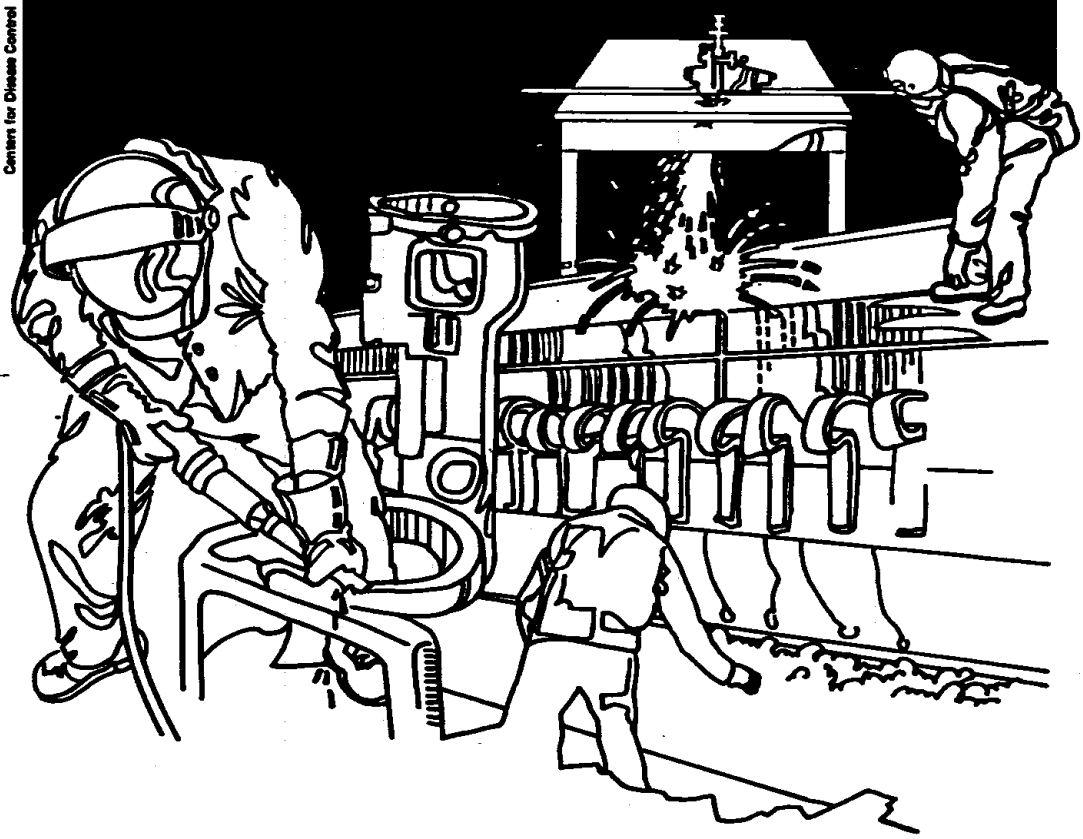

Health Hazard Evaluation Report

HETA 90-390-2065
MHETA 86-012-2065
R.T. VANDERBILT COMPANY
GOUVERNEUR, NEW YORK

PREFACE

The Hazard Evaluations and Technical Assistance Branch of NIOSH conducts field investigations of possible health hazards in the workplace. These investigations are conducted under the authority of Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6) which authorizes the Secretary of Health and Human Services, following a written request from any employer or authorized representative of employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found.

The Hazard Evaluations and Technical Assistance Branch also provides, upon request, medical, nursing, and industrial hygiene technical and consultative assistance (TA) to Federal, state, and local agencies; labor; industry and other groups or individuals to control occupational health hazards and to prevent related trauma and disease.

HETA 90-390-2065
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SEPTEMBER 1990
R.T. VANDERBILT COMPANY
GOUVERNEUR, NEW YORK

NIOSH INVESTIGATORS:
David P. Brown, M.P.H.
Wayne Sanderson, C.I.H.
Lawrence J. Fine, M.D.

I. SUMMARY

The study conducted for this health hazard evaluation adds eight years of observation to the mortality study of miners and millers at the Gouverneur Talc Company (GTC) that was published by NIOSH researchers in 1980. The current study was based on 710 white male workers who were employed any time at GTC between 1947 and 1978 and whose vital status was determined as of 1983. When compared to U.S. white male mortality rates, there were statistically significant increases in all causes combined (SMR=128, 161 obs.), all non-malignant respiratory disease (SMR=251, 17 obs.), and lung cancer (SMR=207, 17 obs.). The SMR for lung cancer was slightly higher for the workers with tenure of employment less than 1 year (SMR=222, CI 96, 438) compared to workers with tenure greater than one year (SMR=194, CI 89, 369). The lung cancer risk was higher in those with 20 or more years of latency (SMR=258, CI 137, 441) than in those with less than 20 years of latency (SMR=126, CI 34, 322). The SMR for non-malignant respiratory disease was significantly elevated among those with more than one year of tenure (SMR=290, CI 144, 518).

The magnitude of the risk for both lung cancer and non-malignant respiratory disease indicate that the workplace exposures at GTC are, in part, associated with these excesses in mortality. Possible confounding factors, such as cigarette smoking and other occupational exposures from employment elsewhere, may have contributed to these risks as well. Although the contribution of these confounding factors could not be totally quantified in this study, it is unlikely that they, alone, could account for the observed excess risks.

The principal limitations in this study are; (1) the size of the cohort (especially for those workers with long tenure), (2) the inability to precisely characterize past occupational exposures at GTC or occupational exposures from employment elsewhere, and (3) the lack of reliable smoking data. The elevated risks observed in this study are similar to those in one other study of talc miners in New York State.

In summary, the results of this updated study support the findings of an excess risk for lung cancer and non-malignant respiratory disease which was observed in these workers by NIOSH researchers in 1980. The recommendations for control of exposure made in the 1980 report remain appropriate. It is recommended that this cohort be updated and reanalyzed after ten more years of observation.

Keywords: (SIC 1499) talc, amphiboles, cohort mortality study, mining, lung cancer, non-malignant respiratory disease.

II. INTRODUCTION

Researchers from the National Institute for Occupational Safety and Health (NIOSH) have previously conducted studies of mortality and morbidity patterns and occupational exposures among talc miners and millers.[1-8] In February 1980, NIOSH researchers published a Technical Report entitled "Occupational Exposure to Talc Containing Asbestos"[1], which dealt specifically with talc ore mined by the Gouverneur Talc Company (GTC) in the Gouverneur Talc District in upper New York. This report was divided into three sections (1. Environmental, 2. Cross-sectional morbidity, and 3. Retrospective cohort mortality), which were subsequently published elsewhere [2-4,6].

Additionally there have been three other mortality studies of GTC workers, all of which were based on the same basic data set.[9-11] The interpretation of the epidemiologic findings of these studies; and the controversy about the mineralogical composition of the talc and its contaminants at this mine has been the subject of numerous publications.[12-23]

Authors of the previous mortality studies differ in their conclusions about the excess risk of lung cancer observed in the GTC workers. The 1980 cohort mortality study published by NIOSH researchers concluded, "exposures to asbestiform tremolite and anthophyllite stand out as the prime suspect etiologic factors associated with the observed increase in bronchogenic cancer and non-malignant respiratory disease among this study cohort."[1] Brown et al., also concluded that "exposures to talcs from the Gouverneur mining area are associated with an increased risk of bronchogenic cancer and non-malignant diseases of the respiratory system."[6] Stille and Tabershaw concluded there were "elevated mortalities but no significant increases in the numbers of deaths from lung cancer, from non-malignant respiratory disease, and from all causes."[9] Lamm concluded that the increased lung cancer risk "is most likely due to risk acquired elsewhere, such as prior employments, or to differences in smoking experience or other behavioral characteristics."[11]

On November 9, 1985, R.T. Vanderbilt, Inc., requested that NIOSH conduct a Health Hazard Evaluation (HHE) to update the 1980 NIOSH study of employees at their Gouverneur Talc Company in Balmat, New York, particularly that portion of the study that dealt with the mortality experience of the cohort. In response to this request NIOSH updated the vital status of the cohort through 1983; and evaluated exposure-response by latency using tenure as a surrogate of exposure.

III. METHODS

Cohort Definition

Since the entire working population is white and ninety five percent male, the study cohort was defined as all white males who worked at least one day at GTC between the beginning of operation in 1947 through 12/31/78. This definition did not include any criteria for a minimum length of employment in order to be consistent with the mortality study published in 1980.[1] The demographic and work history data on the cohort were obtained from R.T. Vanderbilt, Inc., and were originally collected and prepared by Tabershaw Occupational Medical Associates (TOMA)[9] and updated by Lamm and Starr.[10] Data on this tape (referred to as the "DRDS master file") were collected from plant personnel records and include GTC job histories (date of hire; age at hire; type, location and duration of each job held while working at GTC; date of termination) and demographic information.

To assure completeness of the cohort and accuracy of work history information, comparisons were made between the "DRDS master file", Social Security Administration (SSA) quarterly reports (1962-1983), separate lists of employees kept by GTC (one from 1947-1962 and one from 1947-1966), and the master file used in the 1980 study.[1,6] Any differences in job history comparisons were resolved using company personnel records.

Vital status was determined as of 12/31/83 for all white male workers in the cohort. If the vital status could not be determined by the SSA or IRS, then verification was determined by telephone follow-up to next of kin. Death certificates were obtained for all deceased persons in the cohort and compared with name, SSN, and date of birth information in the "DRDS master file" to assure a correct match. The underlying cause of death was coded by a nosologist according to the Eighth Revision of the International Classification of Diseases (ICD).

The person-years analysis consisted of a comparison of age-time-adjusted death rates in the study cohort with the mortality experience of U.S. white males. Standardized mortality ratios (SMR's) were computed by the modified life-table technique described by Monson[24] using the OCMAP computer program.[25] Computation of expected number of deaths from the external population rates were adjusted by the OCMAP program for comparability to the Eighth Revision of the ICD using comparability ratios developed by the National Center for Health Statistics. SMR's were calculated by dividing the observed deaths by expected deaths and multiplying by 100. A statistical test to determine whether the SMR was significantly different from 100 was used, and the observed number of deaths was assumed to have a Poisson distribution.[26]

Person-years (PY) were calculated beginning with initial date of employment and accumulated till death or end of follow-up (12/31/83), whichever occurred first. The PYs for all workers were distributed in 5 year age groups and 5 year calendar time periods, for calculation of expected deaths. PYS also were distributed by tenure and time since first employment, in order to examine risk by these variables.

Tenure was used as a surrogate of exposure, being defined as calendar time spent in all jobs between date of first hire and termination of employment or date of record collection. Latency was defined as time from first employment to time of observation.

IV. RESULTS

There were 710 white males who had worked one day or more between 1947, the beginning of construction of GTC, and 1978. Vital status (alive or dead) was determined for the entire cohort. The cause of death was determined for all but 5 (0.7%) individuals. Follow-up was ascertained through 1983, at which time 161 (27%) members of the cohort were dead.

Table 1 provides descriptive data on the cohort. There were a total of 15,294 PY at risk. The average age at hire was 30, and the average age at death was 56. Almost half of the cohort (322/710), half of the deceased members of the cohort (79/161), and half of the lung cancer cases (8/17) had worked at GTC less than one year.

Table 2 compares the observed number of deaths to the number of deaths expected for this cohort based on U.S. white male mortality rates. The following causes of death had SMRs that were significantly elevated above 100: all causes of death (128), all malignant neoplasms (145), lung cancer (207), and non-malignant respiratory disease (251).

Table 3 provides the distribution of lung cancer deaths by tenure and latency. The lung cancer SMR for the latency group with 20 or more years was 258 (CI 137, 441); over half (8/13) of the lung cancer cases in this latency group occurred in the less than 1 year tenure group where the SMR was 357 (CI 154, 704). Those workers with greater than 20 years latency and with greater than 1 year tenure also demonstrated an increase in risk (SMR, 178), however, the excess was not statistically significant.

In Table 4, all causes, malignant neoplasm, lung cancer, and non-malignant respiratory disease mortality are stratified by workers with less than one year tenure and workers with greater than one-year tenure. After stratification, all cause mortality for workers with

less than one-year tenure was significantly elevated; non-malignant respiratory disease mortality was significantly elevated among workers with greater than one-year tenure. Other increases did not achieve statistical significance.

V. DISCUSSION

This is a small cohort (710 workers), of which 161 (22.7%) are deceased. The SMR analysis (Table 2) indicates a statistically significant excess of lung cancer and non-malignant respiratory disease in this cohort. In a previous update of this cohort[9], which determined vital status as of 12/31/78, ten lung cancer deaths had been identified. This update adds eight new lung cancers to the study. The SMR for lung cancer was uniform across tenure strata and increased with increasing latency (Table 3). There was a statistically significant excess in lung cancer in those with 20 years or more latency and with less than one year employment. Those in this latency group with greater than one year duration also exhibited an increased risk but it was not statistically significant. The increased risk of lung cancer among those with short duration also was observed in the 1980 analysis[1]. There are several possible explanations for this observation. First, cohort members may have been employed in other New York State talc mines and mills where there may have been additional exposures to the same or to similar types of mineral dust. This potential confounding variable is difficult to quantify. Based on limited information [1,27] it is known that as many as half of the lung cancer cases worked in other talc mining operations. In addition, there may have been exposure to other lung carcinogens from employment previous to GTC. Second, some of those in the short duration group may have had very high exposures, especially in the early years of the mining operation. This, too, is impossible to quantify, especially for the oldest exposures. Third, the smoking habits among the employees may have been different from the reference population.

Although several diseases associated with cigarette smoking are nonsignificantly elevated, smoking alone does not account for the excess observed in the cohort. At the time of the morbidity study by Gamble[1], which was conducted in 1975, the smoking patterns among GTC workers were not much different from those of U.S. white males. Among those in the cross-sectional study the distribution was: non-smokers (21%) ex-smokers (31%) and smokers (48%). The distribution, in 1976, among white males 20 years and over in the U.S.[28] was: non-smokers (28.2%), ex-smokers (30%), and smokers (41.2%). For those in the age group, 20-44 years old, which is more comparable to the cross-sectional study group, the smoking prevalence rate for U.S. white males was approximately 47%. Using an adjustment for smoking as suggested by Axelson[29]; even if 100% of the cohort were smokers, the risk for lung cancer would have been increased only by 60% or an SMR of 160.

A combination of these factors, mentioned above, may account for the lack of a positive association between lung cancer risk and duration of employment. It also should be noted that the group with less than one year duration represents half of the person-years of the cohort and although those with longer duration also had an increased risk for lung cancer, the number of workers within each strata, by duration of employment greater than one year, was small and the power to detect a significant risk within these strata was limited.

The excess for nonmalignant respiratory disease was more consistently associated with an occupational exposure at GTC. There was a larger excess risk in those with duration of employment over one year compared to those with less than one year.

To evaluate the consistency of the results of the current analysis with prior research at GTC, SMR's for all causes and for lung cancer were compared between three previous mortality studies of this cohort and an earlier proportionate mortality study of New York talc workers (Table 5). The earliest report was of talc workers with >15 years tenure in the northern part of New York State, presumably in the Gouverneur talc district.[30,31] The talc contained asbestos amphibole and serpentine minerals.[32] The proportionate mortality ratio (PMR) for lung cancer was about 3 times expected.[31]

The remaining SMR studies[1,9,11] involved essentially the same cohort as in this study, i.e. white male employees who ever worked at GTC since it began operations. The results are consistent across studies in that both overall mortality and lung cancer mortality were elevated; the SMR for lung cancer in the 20 or more year latency group was 2.6 to 4.6 times expected. Among employees with greater than 20 years latency, the lung cancer SMR was about 2 times greater for employees with less than one-year tenure compared to those with greater than one-year tenure. However, these differences are based on small numbers.

In conclusion, the results of this updated study support the findings of an excess risk for lung cancer and non-malignant respiratory disease which was observed in these workers by NIOSH researchers in 1980. The recommendations for control of exposure made in the 1980 report remain appropriate.

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VII. AUTHORSHIP AND ACKNOWLEDGEMENTS

Report Prepared By: David P. Brown, M.P.H.
Wayne Sanderson, C.I.H.
Lawrence J. Fine, M.D.

Originating Office: Hazard Evaluations and Technical Assistance Branch
Division of Surveillance, Hazard Evaluations and Field Studies

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VIII. DISTRIBUTION AND AVAILABILITY OF REPORT

Copies of this report are currently available upon request from NIOSH, Hazard Evaluations and Technical Assistance Branch, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days, the report will be available through the National Technical Information Service (NTIS), 5285 Port Royal, Springfield, Virginia 22161. Information regarding its availability through NTIS can be obtained from NIOSH Publications Office at the Cincinnati address. Copies of this report have been sent to:

1. R.T. Vanderbilt Company
2. United Steelworkers of America
3. OSHA Region II
4. NIOSH Boston Region

For the purpose of informing affected employees, copies of this report shall be posted by the employer in a prominent place accessible to the employees for a period of 30 calendar days.

Table 1

Description of Cohort
Gouverneur Talc Company
HHETA 86-012

Age Group	Age at Hire n (%)	Age at Death n (%)	Person-years (PY) by Time Period 1947-59	1960-69	1970-79	1980-83	Total PY
<20	107(15)	0(-)	47	37	41	0	125
20-29	311(44)	5(3)	1050	543	864	212	2669
30-39	184(26)	12(8)	1302	1446	1063	462	4273
40-49	64(9)	31(19)	657	1364	1605	492	4118
50-59	32(4)	52(32)	165	624	1304	642	2735
60-69	11(2)	36(22)	86	150	476	352	1064
70-79	1(<1)	21(13)	12	54	119	72	257
≥80	0(-)	4(3)	5	3	21	24	53
Total	710	161	3324	4221	5493	2256	15294
Average	30 yrs	56 yrs					

Table 2

Cause - Specific Mortality of Cohort, 1947-1983

Gouverneur Talc Company
NNETA 86-012

Cause of Death (ICD - 8)+	Number Observed	Number Expected	SMR	95% CI++
All Causes (1-999)	161	125.5	128**	109-150
Respiratory Tuberculosis (010-019)	3	0.7	419	86-1224
All Malignant Neoplasm (140-209)	36	24.8	145*	102-210
Digestive Organs and Peritoneum (150-159)	8	6.5	167	53-242
Esophagus (150)	1	0.6	167	4-963
Stomach (151)	2	1.2	171	21-616
Liver (155-156)	2	0.4	500	58-1729
Pancreas (157)	2	1.3	154	18-544
Respiratory System (160-163)	18	8.7	207**	123-328
Larynx (161)	1	0.4	250	7-1502
Lung(162-163)	17	8.2	207**	120-331
Prostate (185)	1	1.3	77	2-438
Bladder (188)	1	0.7	143	4-864
Kidney (189)	1	0.6	167	4-865
Brain and CNS (191-192)	1	0.9	111	3-625
Lymphosarcoma and Reticulosarcoma (200)	1	0.6	167	4-969
Hodgkin's Disease (201)	2	0.4	500	62-1857
Leukemia (204-207)	2	1.0	200	23-699
Lymphatic (202-203/820.8)	1	0.6	167	4-911
All Diseases of Circulatory System (390-458)	68	60.7	112	87-142
All Non-Malignant Respiratory Disease (460-519)	17	6.8	250**	146-401
Pneumonia (480-486)	6	2.5	240	90-534
Emphysema (492)	3	1.7	176	37-523
Other Non-Malignant Respiratory (460-479, 487-491, 493-519)	8	2.7	296*	130-594
All Disease of Digestive System (520-577)	8	6.7	119	51-235
External Causes (800-998)	18	16.7	108	64-171
Accidents (800-949)	15	11.2	134	75-221
Suicide (950-959)	3	3.8	79	16-231
All Other	11			

\+ International Classification of Disease, Eighth Revision
++ 95% Confidence Interval for SMR
* $p<0.05$
** $p<0.01$

Table 3

Lung Cancer Mortality by Latency and Tenure
1947-1983

Gouverneur Talc Company
MMETA 86-012

Years since date of hire		Tenure-Years 0-<1	1-9	10-19	20-36	Total
0-<10	O/E	0/.5	1/.7	0/0	0/0	1/1.2
	SMR	--	143	--	--	83
	PY	3612	3274	0	0	6885
10-19	O/E	0/.8	2/.5	1/.7	0/0	3/2.0
	SMR	--	400	167	--	150
	PY	2229	1203	1247	0	4680
20-36	O/E	8/2.2	1/1.2	2/.5	2/1.1	13/5.0
	SMR	364**	83	400	182	260
95%	C.I.	(154,704)	(2,457)	(54,1611)	(21,636)	(137,441)
	PY	1870	821	289	751	3731
Total	O/E	8/3.5	4/2.4	3/1.2	2/1.1	17/8.2
	SMR	229	167	250	182	207**
	PY	7711	5297	1536	751	15294

* p < .05
** p < .01

Mean latency: 22.9 (range: 5.5-34.3)
Mean tenure: 6.3 (range: 0.003-23.5)

Table 4

All Cause, All Malignant Neoplasm, Lung Cancer
and All Respiratory Disease Mortality by Tenure

Gouverneur Talc Company
NIOSH 86-012

Cause of Death	Number Observed	Number Expected	SMR	95 C.I.
Workers With Less Than 1 Year Tenure				
All Causes	79	56.0	141**	112-176
All Malignant Neoplasm	15	11.1	135	76-223
Lung Cancer	8	3.6	222	96-438
All Non-Malignant Respiratory Disease	6	3.1	194	72-428
Workers With Greater Than 1 Year Tenure				
All Causes	82	69.5	118	94-147
All Malignant Neoplasm	21	13.8	152	93-230
Lung Cancer	9	4.6	196	89-369
All Non-Malignant Respiratory Disease	11	3.8	289**	145-518

* $p<0.05$
** $p<0.01$

Table 5

Summary: Mortality Studies of New York Talc Workers

Gouverneur Talc Company
MHETA 86-012

Reference	Cohort Eligibility: period of employment	End of Follow-up	Size of Cohort (n)	All Cause Mortality		Lung Cancer Mortality			
						All		>20 yr Latency	
				OBS	RR	OBS	RR	OBS	RR
Kleinfeld[31] 1967	≥15y tenure employed 1940-1969	1969	260	108	--	13	324	--	--
Brown[7] 1980	1/1/47-12/31/59	6/30/75	398	74	121	9	273*	6	462**
Stille[10] 1982	1/1/48-12/31/77	12/12/78	655	113	106	10	157	--	--
Lamm[12] 1988	1947-12/31/77	12/31/78	605	118	141*	12	240*	--	--
This Study	1947-1978	12/31/83	710	161	128**	17	207**	13	258*

* p< .05
** p< .01
OBS = Observed number of deaths
RR = PMR or SMR