File under Owens Corning Fiberglass

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RICHARD F. CELESTE
Governor

PLAINTIFF'S EXHIBIT
K-2011

May 16, 1989

Mitchell Singal, M.D., M.P.H.
Chief Medical Section
Mailstop R10
National Institute of Safety and Health
4676 Columbia Parkway
Cincinnati OH 45226

Dear Mitch:

We recently presented the enclosed report to the local Presidents and safety stewards of the involved unions and later that day to both the unions and management representatives of the Owens Corning Fiberglas Corporation. As you can see, we found strong evidence that conditions exist in the wool-forming basement area of the Newark Plant which are associated with reports of respiratory conditions among employees having contact with that area.

I would like to request your assistance in further evaluating the apparent health problems indicated by our study. I think the next step would include evaluation of the reported conditions by a medical epidemiologist to verify the reported instances of respiratory illness. The Division of Epidemiology and Toxicology does not have the capabilities to carry out this kind of work.

We informed the three unions and Owens Corning management that we would be sending this to you and that they could expect to hear from you within several weeks to discuss what help you and your staff could offer.

We will be pleased to assist you in any way we can with your efforts.

Sincerely,

B. Kim Mortensen, Ph.D.
Chief, Division of Epidemiology and Toxicology

bkm:O_C_niosh

Enclosure

cc: [redacted] Marquard - Ohio Industrial Commission
W.R. Bowman - Plant Manager, Owens Corning-Newark
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R. Edwards - IAMAW Local 1280
P. Painter - IBEW Local 1206
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Summary of an investigation of respiratory illness at the Owens Corning Fiberglas Corporation, Newark plant

May 11, 1989

The Ohio Department of Health, Division of Epidemiology and Toxicology, conducted an investigation of respiratory illness at the Owens Corning Fiberglass Corporation, Newark plant. In early April, 1987, the Division received a report from a union steward of respiratory problems at this facility. The steward requested an investigation of the respiratory health problems in the wool-forming department. This employee provided a list of co-workers who had symptoms of possible hypersensitivity pneumonitis. Six of these employees were contacted by telephone. They reported symptoms including cough, shortness of breath, fever, and difficulty breathing. These symptoms reportedly worsened at work and improved on days off from work.

The plant has had a history of respiratory problems in workers, expecially in the wool-forming basement area. For this reason, the Division decided to undertake a screening survey to determine if respiratory problems continued to exist in specific areas of the facility. The survey was designed to detect respiratory problems based upon workers' reports, whether they were medically confirmed or not.

A questionnaire was mailed to three hundred eighty employees of the wool-forming basement area and maintenance personnel. One hundred seventy eight, or just fewer than half of the questionnaires were returned. The study period of interest was July 1, 1987, through early February, 1988.

Thirty-one individuals had symptoms resembling hypersensitivity pneumonitis which worsened on work days and improved on days off. Men meeting a case definition (cases) were more likely to have had to leave work at least once due to respiratory problems than persons who did not fit the definition (non-cases). Cases had reported generally poorer health status than non-cases.

Cases and non-cases were similar in terms of age, race, and sex. No pattern was found in length of employment, job classification, job department, shift usually worked, use of protective equipment in the wool-forming basement area, pipe smoking, animals in the home, use of sickdays, or hospital visits.

In these data, those who spent time in the wool-forming basement area were more likely to report symptoms that are compatible with hypersensitivity pneumonitis. These symptoms are also associated with smoking; but the association with exposure to the wool-forming area remains when smoking is controlled for. The symptoms are not characteristic of those ordinarily associated with smoking, particularly the worsening of symptoms at work and their improvement away from the workplace.

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These data suggest that conditions exist in the wool-forming area of the plant that affect the employee's health. These conditions could be influenced by several biases: misclassification of cases and non-cases, recall bias, and a low response rate.

The company may consider conducting an additional industrial hygiene survey to see if there are problems with the wool-forming process or with inadequate ventilation or improper use of protective equipment. Additional studies should be conducted to establish a firm diagnosis for this syndrome, determine its actual incidence, and find appropriate techniques to avoid further problems.

The Division is referring the issue to the National Institute for Occupational Health and Safety (NIOSH) in Cincinnati, Ohio, for consideration of these recommendations.

Final Report

A Cross-sectional Study of Respiratory Illness Among Workers at Owens Corning Fiberglas Corporation, Newark Plant

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March 1, 1989

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Summary

The Ohio Department of Health, Division of Epidemiology and Toxicology, conducted a cross-sectional investigation of respiratory illness at the Owens Corning Fiberglas Corporation, Newark plant. The plant has had a history of respiratory problems in workers, especially in the wool-forming basement area. A questionnaire was mailed to employees of the wool-forming basement area and the maintenance personnel. One hundred seventy-eight questionnaires out of 380 were returned for a response rate of 46.8%. The study period of interest was July 1, 1987 through early February 1988.

Thirty-one individuals met the case definition of two or more of the following symptoms which worsened on work days and improved on days off: cough, shortness of breath, wheezing, fever/chills, or myalgia (aches). Cases were more likely to have had to leave work at least once due to respiratory problems than non-cases. Cases had a lower reported health status than non-cases. Those who met the case definition reported their health to be in the good-fair categories (90%), while the majority of non-cases reported themselves to be in good to excellent health (88%).

There were no significant differences between the cases and non-cases in terms of age, race or sex. No pattern was found in length of employment; job classification; job department; shift usually worked; use of personal protective equipment in the wool-forming basement area; pipe smoking; animals in the home; use of sickdays; or hospital visits due to respirartory problems.

There were significant differences between the two groups in terms of current smoking status (51.6% of the cases were current smokers vs. 25.9% of the noncases, P = 0.02) and exposure to the basement area one hour or more per week (84% of the cases vs. 58% of the noncases, P = 0.03). Spending time in the wool-forming basement area was associated with the case definition among ex-smokers and non-smokers taken together (odds ratio = 8.57, 95% C.I. 1.11 to 180.8). The odds ratios were increased for all three categories: smokers - 2.85; ex-smokers - 4.24; and non-smokers - 9.41.

This study found an association between respiratory symptoms and time spent in the wool-forming basement area. These data suggest that conditions exist in the wool-forming area of the plant that affect the employees' health. These conclusions could be influenced by several possible biases: misclassification of cases and non-cases, recall bias, and a low response rate. We recommend that additional studies be conducted to confirm the reported cases of respiratory problems suggestive of hypersensitivity pneumonitis, to establish a definitive diagnosis in these workers, to obtain a better estimate of prevalence of this illness, and to allow design of appropriate control measures to prevent additional cases.

Introduction

In early April, 1987, the Ohio Department of Health, Division of Epidemiology and Toxicology, received a report from an employee of Owens Corning Fiberglas facility in Newark, Ohio of possible respiratory problems at that facility. The employee, who was a union steward, asked for an investigation of the prevalence of hypersensitivity pneumonitis and other health problems among employees in the wool forming department of the Owens Corning facility. This employee provided a list of fellow employees with symptoms of possible hypersensitivity pneumonitis. Six of these were contacted by telephone. Reported symptoms included cough, shortness of breath, fever and difficulty breathing. These symptoms reportedly worsened at work and improved on days off from work.

Acute hypersensitivity pneumonitis is characterized by lower respiratory and systemic symptoms e.g. fever, chills, myalgia, weight loss and shortness of breath. (Fink, 1986). Symptoms usually appear within four to six hours after exposure to inhaled organic antigens such as some fungi (e.g. thermophilic actinomycetes) or animal proteins. Pulmonary function abnormalities can also be demonstrated in some individuals. Approximately four to six hours after exposure, there is a decrease in the forced vital capacity (FVC) and one-second forced expiratory volume (FEV_1). The acute attack usually resolves itself within a relatively short period of time (12-18 hours) when exposure is halted. Chronic hypersensitivity pneumonitis can occur after repeated exposures to an antigen. This chronic form may result in irreversible damage to the peripheral gas-exchanging lung tissues. Typical symptoms of chronic hypersensitivity pneumonitis are chronic cough, malaise, weakness and progressive shortness of breath.

The Owens Corning plant physician supplied a summary of past problems in the wool-forming area. In 1977, several craft workers reported symptoms of chest tightness, cough, myalgia, headaches and chills with fever. Most worked in the wool-forming basement for only part of each workday, rather than full-time. They reported symptoms that appeared 4 to 6 hours into their work shift and continued to increase in severity until the end of their shift. Generally, symptoms persisted 10 to 12 hours following the exposure and then stopped. Clusters of illness appeared in the winter months when ventilation was suboptimal. Workers were asked to wear organic vapor respirators with dust filters. No more cases occurred until January 1978 when there were several individual cases.

In the winter of 1981 a significant number of these illnesses were again noted and the company decided to look for organic allergens. Symptoms suggested a classic form of acute hypersensitivity pneumonitis. The wool-forming area is a warm,

damp environment in which potentially sensitizing organisms could be expected to grow well. In March 1981, samples of residue and waste water were collected from various areas of the wool-forming basement and from the mound of accumulated debris in Building #9. All samples of residue and waste water cultured positive for potential sensitizers. Specific organisms identified included: Aspergillus fumigatus, Lactobacillus sp., Thermactinomyces vulgaris, Thermoactinomyces candidis, several gram-negative bacteria and various forms of yeast.

Eighteen employees with symptoms compatible with hypersensitivity pneumonitis were examined by the company at this time. Their sera tested positive for precipitating antibodies to the crude environmental extract as well as some of the specific organisms which had been identified. Several biocides were added to the process waters and the pH of the water was adjusted to control bacterial growth. (Cairns, 1987).

Since 1981, Owens Corning management has believed that the control measures described have been successful in eliminating the problem of hypersensitivity pneumonitis associated with the wool-forming area, although the biocides have not been uniformly successful in controlling bacterial growth. Some of the workers who were contacted initially by the state health department did not agree with this assessment. Based on the potential seriousness of respiratory ailments and the information presented above, the Ohio Department of Health, Division of Epidemiology and Toxicology initiated an investigation of the workers at the Owens-Corning facility to ascertain if there had been a recurrence of respiratory problems at this plant.

Methods

The population of interest for this investigation was defined as all Owens Corning Fiberglas Corporation, Newark Plant employees who were included in the Department 42 Wool-Forming Seniority Report or the Maintenance Department Seniority Report. These reports were supplied by company otficials. These areas were selected since they included the employees for which the preliminary information had been gathered and where concern over ill health effects such as hypersensitivty pneumonitis had been suggested. Some but not all of the employees on both lists had periodic exposure to the wool-forming basement work area.

A questionnaire was developed, using as a model questionnaires used by the National Institute for Occupational Safety and Health (NIOSH). Questionnaires were mailed to each employee in the study group in February, 1988. Three days after the initial mailing, telephone calls were made to verify receipt of the materials. One week later, a reminder notice/thank you letter was sent. Two weeks after the initial mailing, letters and replacement questionnaires were sent to the nonrespondents. The questionnaire covered six major areas: 1) demographic information; 2) occupational history; 3) personal exposure; 4)

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respiratory symptoms; 5) non-respiratory symptoms; and 6) medical history. A copy of the questionnaire is included in Appendix A. Respondents were asked about symptoms and work exposures during the period from July 1, 1987 until date of completion of the questionnaire, generally in early February 1988.

A case was defined as an employee reporting two or more of the following symptoms which worsened on work days and improved on days off: cough, shortness of breath, wheezing, fever/chills, or myalgia. This definition was designed to capture a complex of symptoms consistent with hypersensitivity pneumonitis. Similar symptoms had been reported by the original six employees interviewed. SAS (The Statistical Analysis System) and dEpid, an epidemiologic analysis program distributed by the US Centers for Disease Control, were used to calculate frequencies and statistical tests. Comparisons between proportions of cases and non-cases were made using Chi Square and Fisher's Exact tests. Odds ratios were also calulated where appropriate, with exact 95% confidence limits calculated by the Cornfield method, which gives narrower confidence intervals than either Taylor-series-based methods or Miettinen's test-based method.

Results

One hundred seventy-eight respondents participated in the cross-sectional survey out of a potential 380 respondents, for a response rate of 46.8%. Thirty-one individuals met the case definition. No information was available concerning non-respondents. Therefore, it is not possible to make any statements comparing those who answered the questionnaire and those who did not.

There were differences between cases and controls in reported histories of three prior respiratory conditions: pneumonia (OR = 4.43, p = 0.002), bronchitis (O.R. = 2.82, p = 0.051), and hypersensitivity pneumonitis (O.R. = 18.9, p = 0.012), but not of hay fever, sinusitis, emphysema, asthma, or tuberculosis.

Cases were more likely to have had to leave work because of respiratory symptoms, and to have low self-reported health status, than non-cases. Twenty-nine percent of the cases had left work due to respiratory problems compared to 8.2% of the non-cases. (Table 1). The workers who met the case definition reported significantly poorer health status than those who did not (Table 2). Of the workers who met the case definition, 19.3% reported their health status as only fair, compared to 6.8% of the workers who did not meet the definition. Conversely, only 3.2% of the case workers reported their health status as excellent, compared to 22.5% of the non-case workers. There was no difference between the two groups in reported number of sick days taken from July 1987 through February, 1988, however.

Respondents who met the case definition and who smoked (16 of the 31 cases) were somewhat more likely to report myalgia (7 cases), cough (11 cases), or chills (10 cases) than were the 15 cases who were not current smokers (4,9,and 6 cases reporting myalgia, cough or chills respectively). Conversely, non-smokers were slightly more likely to report wheezing (11 vs 10), and equally likely to report shortness of breath (8 cases in both groups). Among non-cases, these symptoms individually were quite rare, occurring in no more than two of the 38 smoking non-cases and no more than five of the 107 non-smoking non-cases. Smoking cases reported an average of 2.87 of the symptoms contained in the case definition, while non-smoking cases reported an average of 2.53 of these symptoms.

There were no significant demographic differences between cases and controls (Table 3). The mean age was 43.13 years for those who met the case definition and 44.17 years for non-cases. The majority of the respondents were white (97% for cases and 93% for non-cases). All of the respondents were male.

There was little difference between the two groups in length of employment (Table 4). The average was 18.36 years for cases and 19.93 years for non-cases. There was also no significant difference in the shift worked. All respondents except one worked on either the day shift or rotating shifts (Table 5). Current job title and current department were distributed similarly among cases and non-cases. Among questionnaire respondents, attack rates for illness meeting the case definition ranged from 15.4 (8/52) of woolforming employees to 27.8% (5/18) of welders. For the five categories of craft workers taken together (machine repairmen, electricians, welders, pipe-fitters, and sheetmetal workers), the attack rate among respondents was 18.3% (23 of 126 respondents). Eight of 31 persons meeting the case definition were wool-forming employees; the remainder were among the craft workers.

No significant differences were found between the two groups in terms of pipe usage; respiratory, eye or ear protection measures used in the basement area; hospitalization due to lung/respiratory problems; or close contact with animals (data not shown).

There was a significant difference in distribution of cigarette smoking status between cases and non-cases (Table 6; $p = 0.02$). Smokers comprised more than half of the cases (51.6%) versus 25.9% of the non-cases. Cases were less likely than non-cases to be ex-smokers or never to have smoked.

Exposure to the basement wool-forming area was examined using several approaches (Tables 7-9). The odds ratio for basement exposure was 3.59 (95% C.I. 1.22,11.33). There was weak evidence for a dose-response relationship: the odds ratio for exposure to the basement area 24 to 40 hours per week (compared to no

exposure) was 4.5, while it was 3.6 for exposure 1 to 23 hours per week. Exposure to the basement area was associated with case status within each smoking stratum (smokers, ex-smokers, and non-smokers), although the odds ratio was not statistically significantly different from 1.0 in any of these groups taken by itself. The odds ratios were increased for all three categories: for smokers it was 2.85; for ex-smokers 4.24; and for non-smokers 9.41.

In a crude analysis, both current smoking status (OR = 2.95 95% C.I. (1.24, 7.03)) and work in the basement (OR = 2.59 95% C.L. (1.22,11.33)) were associated with the case definition. Current smoking was associated with the case definition both in workers with wool-forming basement exposure (OR = 2.87 95% C.I. (1.05, 7.95)) and at borderline statistical significance in workers without such exposure (OR = 8.63 95% C.L. (0.81, 217.3)). Four out of five cases without basement exposure were current smokers. The odds ratio for persons with both basement exposure and current smoking, compared to those with neither exposure, was 24.6 95% C.I. (2.92, 541.9), suggesting a strong interaction between these two exposures. Among non-smokers and ex-smokers taken together, the odds ratio for basement exposure was 8.57 95% C.I. (1.10, 180.8). Among current smokers, the odds ratio was also elevated at 2.85 but not significantly different from 1.0. The lower odds ratio in this group may reflect misclassification of some cases of smoking-related disease (e.g. chronic bronchitis) as cases meeting the study case definition. The odds ratios for this analysis are shown in Table 9.

When these analyses were repeated with a stricter case definition requiring at least three of the five symptoms, aggravated at work and relieved on days off, there were only 16 cases meeting the new case definition. In general the results were similar to those with a less restrictive case definition. Illness meeting this case definition was still associated with being a current smoker (O.R. = 3.3, 95% C.I. 1.04 to 10.54) and with exposure to the basement (O.R. = 4.55, also 0.94 to 30.03), although the level of statistical significance was reduced in both cases. The odds ratio for basement exposure among non-smokers was 3.28, and among smokers was 7.65; in both cases the 95% C.I. included 1.0.

Discussion

Analysis of this cross-sectional survey of Owens Corning Fiberglas employees suggests that smoking and wool-basement exposure are independently associated with the symptom complex summarized in the case definition. These two exposures appear to interact: persons with both exposures show a sharply elevated risk of illness meeting the case definition. In addition, cases were more likely than controls to have a reported history of pneumonia, bronchitis or hypersensitivity pneumonitis, to have had to leave work because of respiratory problems, and to have lower self-reported health status.

Spending time in the wool-forming basement area is strongly correlated with respiratory ailments even after stratification by smoking status. It was necessary to control for smoking since many of the symptoms used in the study case defintion can also result from smoking. The risk of having respiratory disease meeting the two-symptom case definition was over 9 times greater for non-smokers who spent some work time in the basement area than those who did not (Table 3). It was four times as great for ex-smokers and approximately three times greater for current cigarette smokers. There were no significant differences between the two groups in terms of current department of employment. There were also no differences in terms of shift, length of employment, or job title.

The high odds ratio observed for exposure to the wool-forming area in non-smokers, with lower odds ratios for ex-smokers and current smokers, may reflect misclassification of smoking-related illness as illness meeting the study case definition. If this occurred, it would tend to result in a bias toward the null, that is, the odds ratio for basement exposure observed in smokers would be lower than it would have been in the absence of misclassification. The best measure of the effect of exposure to the wool-forming area on the risk of illness meeting the case definition is probably the odds ratio in non-smokers and ex-smokers.

Other possible sources of bias in this study include recall bias and non-response. Workers who met the case definition may have recalled exposure to the wool-forming area more completely than workers who did not meet the definition. There is no direct way to be certain that this did not occur, although the relatively infrequent history of wool- forming basement exposure in the smokers who met the case definition suggests that workers were being careful in answering the questions as asked. There was a relatively low response rate, as was expected with a mail questionnaire. In an attempt to counteract this, follow-up letters and phone calls were used to increase the response rate. In order for non-response to have biased our estimates of odds ratio, response rates would have had to vary both by case/control status and by exposure status.

There was no opportunity to validate the questionnaire responses against personal interviews, medical record reviews, or physical examinations. Our case definition was deliberately made fairly broad, in order to identify as many cases of potential hypersensitivity pneumonitis-like illness as possible. In a careful review of individual case histories and physical examinations, it is possible that some persons who met our screening case definition would not meet a more rigorous definition. Nonetheless, this would invalidate the associations noted in these data only if persons misclassified as cases were more likely to have overstated their history of basement exposure than persons who were not classified as cases.

Conclusions

It is not possible to ascertain from a questionnaire alone the exact nature of the illness reported by these workers. The case definition was constructed to capture illness similar in symptoms to what would be expected of hypersensitivity pneumonitis. Cases were counted only if symptoms were reported to worsen after a few hours at work and resolve after returning home from work and on days off. This is characteristic of hypersensitivity pneumonitis. Nonetheless, to confirm that the syndrome reported is in fact hypersensitivity pneumonitis, workers would have to be examined and have pulmonary function tests, ideally before and after a shift, and both symptomatic and non-symptomatic workers would have to be tested for precipitating antibodies to potential sensitizing agents currently present in the work environment.

Workers exposed to the wool-forming basement area at the Owens Corning Fiberglas facility in Newark, Ohio reported experiencing a syndrome exacerbated at work and remitting at home, with symptoms compatible with hypersensitivity pneumonitis, during the second half of 1987. In these data, work in the wool-forming basement area is associated with these symptoms. Symptoms were occuring in workers with less than full- time exposure to the wool-forming area, as well as in full-time workers. These symptoms are also associated with smoking, but the association with exposure to the wool-forming area remains when smoking is controlled for. The symptoms are not characteristic of those ordinarily associated with smoking, particularly the worsening of symptoms at work and their improvement away from the workplace. The company may consider conducting an additional industrial hygiene survey to see if there are additional problems such as inadequate ventilation or improper use of personal protective equipment.

Additional studies should be conducted to establish a firm diagnosis for this syndrome, determine its actual incidence, and find appropriate techniques to avoid future problems. The Division is referring the issue to the National Institute for Occupational Health and Safety (NIOSH) in Cincinnati, Ohio.

Respectfully submitted:

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Table 1

Self-Report of Leaving Work Due to Respiratory Problems, Questionnaire Respondents, Owens Corning Fiberglas Plant, Newark, OH

	Cases (n=31)		Non-cases (n=147)	
	No.	Percent	No.	Percent
No	20	(64.52%)	126	(85.72%)
Yes	9	(29.03%)	12	(8.16%)
Not Answered	2	(6.45%)	9	(6.12%)

Odds ratio (excluding unknowns) = 4.725 (1.59, 14.08)

Table 2

Self-Reported Health Status, Questionnaire Respondents, Owens Fiberglas Plant, Newark, OH

	Cases (n=31)		Non-cases (n=147)	
	No.	Percent	No.	Percent
Excellent	1	(3.2%)	33	(22.45%)
Good	22	(71.0%)	96	(65.31%)
Fair	6	(19.35%)	10	(6.8%)
Poor	0		0	
Not Answered	2	(6.45%)	8	(5.44%)

Chi-square = 9.63 (2 d.f.), $p < .01$

Table 3

Demographic Characteristics for Study Populatio: Questionnaire Survey, Owens Corning Fiberglas Plant, Newark OH

Age Groups	Cases (n=31)		Non-cases (n=147)	
20-29 years	0		1	(0.68%)
30-39 years	12	(38.7%)	42	(28.57%)
40-49 years	14	(45.2%)	63	(42.85%)
50-59 years	5	(16.1%)	38	(25.85%)
60 + years	0		1	(0.68%)
Not Answered	0		2	(1.36%)

Chi-square (3 d.f.) = .399, not significant at .05 level.

Mean Age	43.13 ± 6.71	44.13 ± 7.36

Table 4

Length of Employment of Questionnaire Respondents, Owens Corning Fibergl: Plant, Newark, OH

ears	Cases (n=31)		Non-cases (n=147)	
	No.	Percent	No.	Percent
0-9 yrs	4	(12.9%)	8	(5.4%)
10-19 yrs	13	(41.9%)	57	(38.8%)
20-29 yrs	12	(38.7%)	65	(44.2%)
30-39 yrs	2	(6.5%)	15	(10.2%)
40 + yrs	0		1	(0.7%)
Not Answered	0		1	(0.7%)

Chi-square (4 d.f.) = 2.93, not significant at .05 level

Mean length of employment (± S.D.)	18.36 ± 7.73	19.93 ± 7.54

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Table 5

Shifts Worked by Questionnaire Respondents, Owens Corning Fiberglas Plant, Newark, OH

	Cases (No. and %)		Non-cases (No. and %)	
Day	19	(61.3%)	84	(57.1%)
Rotating	11	(35.5%)	62	(42.2%)
Other	1	(3.2%)	0	
Not Answered	0		1	(0.7%)

Chi-square (1 d.f., day vs. rotating) = .345, not significant at 0.05 level

Table 6

Cigarette Smoking Status, Questionnaire Respondents, Owens Corning Fiberglas Plant, Newark, OH.

	Cases		Non-cases	
	No.	Percent	No.	Percent
Never Smoked	7	(22.58%)	47	(31.97%)
Ex-smokers	8	(25.81%)	60	(40.82%)
Current Smokers	16	(51.61%)	38	(25.85%)
Not Answered	0		2	(1.36%)

Chi-square (2 d.f.) = 7.78, p = .02

Table 7

Weekly Number of Hours Worked In Wool-Forming Basement,
Questionnaire Respondents, Owens Corning Fiberglas Plant, Newark, OH

Hours	Cases (n=31)		Non-cases (n=147)	
	No.	Percent	No.	Percent
None	5	(16.1%)	60	(40.8%)
1-23 hrs/wk	23	(74.2%)	77	(52.4%)
24-40+hrs/wk	3	(9.7%)	8	(5.4%)
Not answered	0		2	(1.4%)

Chi-square (2 d.f.) = 7.12, p = .029

Table 8

Basement Exposure, Stratified by Smoking Status, Questionnaire Respondents
Owens Corning Fiberglas Plant, Newark, OH

	Cases	Non-cases	Total
Non-smokers			
Basement Exposure:			
yes	7	29	36
no	0	18	18
Total	7	47	54
	Odds ratio = 9.407 (0.51, 174.62)		
Ex-smokers			
Basement Exposure:			
yes	7	38	45
no	1	23	24
Total	8	61	69
	Odds ratio = 4.237 (0.46, 97.40)		
Smokers			
Basement Exposure:			
yes	12	20	32
no	4	19	23
Total	16	39	55
	Odds ratio = 2.85 (0.68, 12.81)		

Table 9

Wool-Forming Basement Exposure and Smoking: Stratified Analysis, Questionnaire Respondents, Owens Corning Fiberglas Plant, Newark OH.

	Cases (n=31)	Non-cases (n=147)	Odds Ratio 95% C.I
Smoking			
Crude odds ratio			
Current Smokers	16	39	2.95
Ex- and Non-smokers	15	108	(1.24, 7.03)
No Basement Exposure			
Current Smokers	4	19	8.63
Ex- and Non-smokers	1	41	(0.81, 217.3)
With Basement Exposure			
Current Smokers	12	20	2.87
Ex- and Non-smokers	14	67	(1.05, 7.95)
Basement Exposure			
Crude odds ratio			
Exposed	26	87	3.59
Not exposed	5	60	(1.22,11.33)
Ex- and Non-Smokers			
Exposed	14	67	8.57
Not exposed	1	41	(1.11, 180.8)
Smokers			
Exposed	12	20	2.85
Not exposed	4	19	(0.68, 12.81)
Both Smoking and Basement Exposure			
Exposed to both	12	20	24.6
Neither Exposure	1	41	(2.92, 541.9)