Respiratory Symptoms of Employees of Retail Meat Departments

Preliminary results of a study in northeastern Ohio

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A RECENTLY IDENTIFIED ASTHMA-LIKE SYNDROME, "meat wrappers' asthma," is characterized by reversible airways obstruction with dyspnea, cough, and wheezing. In presentations of three meat wrappers' cases, Sokol and co-workers suggested a causal link between the inhalation of polyvinyl chloride (PVC) fumes released during the meat-wrapping process and the occurrence of respiratory symptoms (*1*). Polakoff and co-workers, using questionnaires along with pre- and post-workshift pulmonary function tests, com-

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pared the respiratory symptoms of 17 meat wrappers and 21 store clerks who served as controls (*2*). The results of their study suggested that meat wrappers have a higher prevalence of chronic respiratory irritation, combined with an altered responsiveness of airways, and that the pyrolytic products of PVC have adverse effects on health. These results, however, could not be considered conclusive because of the small sample size and because the two groups compared were not suitably matched with regard to age, sex, race, height, and smoking status.

"Meat wrappers' asthma" shares some of the clinical features of polymer-fume fever, an illness caused by exposure to the fumes of PTFE (polytetrafluoroethylene—trademark "Teflon"), as was detailed by Harris in 1951 (*3*). Like polymer-fume fever, meat wrappers' asthma is manifested in chest tightness, difficulty in breathing, and a dry, nonproductive cough. Chills, fever, and sore throat are characteristically associated with PTFE, but not with meat wrappers' asthma (*1,3*). Additionally, another asthma-like illness has been reported in conjunction with the manufacture or spraying of polyurethane materials containing toluene diisocyanate and in fires involving polyurethane products (*4,5*).

Studies of retail meat department employees with regard to the possible carcinogenicity of PVC products have not been reported, although the need for such studies has been suggested by Polakoff and coworkers (*2*), as well as by others.

To examine further the possible respiratory morbidity posed by exposure to PVC fumes, Meat Cutters District Union 427 of the Amalgamated Meat Cutters and Butcher Workmen of North America sponsored a survey of 3,550 of its members who were employees of retail meat departments in northeastern Ohio. The survey was a collaborative project of the District Union, the School of Medicine of Case Western Reserve University, and the Kaiser Community Health Foundation. The preliminary findings of the project are presented in this paper.

Study Methods

In April 1974, the Kaiser Foundation distributed questionnaires to the 3,550 members of District Union 427 who were retail meat department employees. The 2,650 of its members who were not retail employees were excluded from the survey. District Union 427 represented nearly all the retail food outlets in a densely populated 15-county area of northeastern Ohio. The screening questionnaire consisted of 19 items on personal and demographic characteristics, occupational status, and history of smoking and allergies, with particular emphasis on lower respiratory symptoms (cough, sputum production, wheezing, and shortness of breath). The questions were not designed to gather data on temporal relationships, but to determine the current status of the workers with respect to each of the variables and to afford an estimate of the morbidity in this population during the period April through June 1974.

We divided the responses to the screening questions on respiratory symptoms into two categories, "symptoms" and "symptoms at work." Responses to the questions "Do you cough?" "Do you wheeze?" "Do you produce sputum or phlegm?" and "Are you often short of breath?" were put into the category "symptoms." These questions were designed to identify the presence of selected respiratory symptoms, irrespective of the place where these symptoms were manifested (that is, whether at a work or nonwork location). A positive response to the question "Do you experience more cough, sputum, wheezing, or shortness of breath at work?" was used to isolate place-related "symptoms at work." The adjective "more" in this question was intended to be interpreted in the literal sense, that is, "more" implied either increased frequency or greater magnitude. In our analysis, we considered "more" to be equivalent to the adjective "worse" within the context of the symptoms reported in this survey. With this question, which was designed to be as general as possible, we sought to determine whether respiratory symptoms were experienced "more" in the work environment than in the general living environment.

To assure confidentiality, the questionnaire contained no personal identifying information such as name or address. For control purposes, the respondent entered his or her name on an independent master file card, which was numerically matched to the questionnaire but was accessible only to medical personnel. The questionnaire and master file card were returned to the Kaiser Foundation in a self-addressed, postage-paid envelope.

Photostats of all returned questionnaires were delivered to the Case Western Reserve University School of Medicine and prepared for analysis. At the school, data from the questionnaires were edited, coded, keypunched, and then processed on mechanical and electronic equipment, including a Univac 1108 computer.

During our final analysis of the screening survey, phase 2 of the investigation was implemented. Its methodological design allowed a preliminary analysis of the 2,652 nonresponders identified in phase 1. A random sample consisting of 100 of these non-

responders permitted a preliminary evaluation of the similarities and differences in the responder and the nonresponder groups.

District Union 427 offered its full cooperation throughout the study and was active in its implementation. During the startup period, an announcement of the survey was published in the Union's monthly newsletter, and Union business representatives and shop stewards were briefed about it in special meetings. Initial discussions with Union officials and Kaiser Foundation medical staff led to a decision to query the entire retail membership of the Union rather than to use probability sampling. Both Union officials and the Kaiser Foundation staff were concerned about the possibility that a survey technique which did not include the entire membership might result in a needless increase in anxiety and in unwarranted fears of discrimination. A letter from the president of the District Union, distributed with the survey questionnaire, assured all Union members of the confidentiality of the study and encouraged their participation.

Results

Of the 3,550 meat cutters and wrappers queried, only 25 percent (898) returned completed questionnaires to the Kaiser Foundation. This modest response requires that these preliminary data be viewed with caution.

An analysis of responses to each question in the survey showed that of the 25 percent of the original sample who elected to participate, between 90 and 96 percent answered each question on respiratory symptoms and between 95 and 100 percent answered the questions on worker characteristics and on smoking and allergies.

Worker characteristics. The retail meat department employees were divided into two major occupational categories, meat wrappers and meat cutters. Of the 898 respondents, 49.1 percent were identified as cutters, 43.0 percent as wrappers, 3.1 percent as both, 3.2 percent as other, and 1.6 percent as undeterminable. Of 100 randomly selected nonresponders, the distribution of retail meat department employees by work category was 28.0 percent meat cutters, 36.0 percent meat wrappers, 2.0 percent both cutters and wrappers, and 14.0 percent other work categories.

Only one respondent in the meat cutter group was a woman, but 379, or 98.2 percent, of the 386 meat wrappers who responded were women (table 1).

The distribution by sex of the respondents to the questions about age and sex was 54.1 percent men and 45.9 percent women (table 2). These respondents ranged in age from 18 to 74 years, but more than 50 percent were between the ages of 40 and 60. The

Table 1. Distribution of respondents by occupation and sex

Occupation and sex	Number	Percent
Total	[1] 884	100.0
Male	479	54.2
Female	405	45.8
Cutter [2]	441	100.0
Male	440	99.8
Female	1	0.2
Wrapper [2]	386	100.0
Male	7	1.8
Female	379	98.2
Cutter-wrapper [2]	28	100.0
Male	21	75.0
Female	7	25.0
Other [2]	29	100.0
Male	11	37.9
Female	18	62.1

[1] 14 respondents (1.6 percent of 898) who failed to answer questions on sex or occupation, or on both, are not included.
[2] Cutters comprised 49.9 percent of the 884 respondents, and wrappers 43.7 percent; respondents who were both cutters and wrappers comprised 3.2 percent; 3.3 percent of the respondents fell into the "other" category.

Table 2. Distribution of respondents by age and sex

Age (years)	Total		Male [1]		Female [1]	
	Number	Percent	Number	Percent	Number	Percent
Under 20	14	1.6	5	1.0	9	2.2
20–29	143	16.0	81	16.7	62	15.1
30–39	180	20.1	112	23.1	68	16.5
40–49	219	24.5	118	24.4	101	24.6
50–59	254	28.4	118	24.4	136	33.1
60–69	84	9.4	49	10.1	35	8.5
70 and over	1	0.1	1	0.2	0	0.0
Total	[2] 895	100.0	484	100.0	411	100.0

[1] Men comprised 54.1 percent, and women 45.9 percent, of the 895 respondents. The mean age of the men was 43 and of the women, 44.
[2] 3 respondents (0.3 percent of 898) who failed to answer questions on sex or age, or on both, are not included.

Table 3. Distribution of respondents by age group, smoking status, allergy status, and occupation

Characteristic	Total		Cutters		Wrappers		Cutter-wrappers		Other	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Age [1]										
Under 20	14	1.6	5	1.1	9	2.3	0	0.0	0	0.0
20–29	141	16.0	78	17.8	57	14.8	3	10.7	3	10.3
30–39	178	20.2	108	24.6	65	16.9	3	10.7	2	6.9
40–49	217	24.6	105	23.9	97	25.2	9	32.1	6	20.7
50–59	249	28.3	100	22.8	124	32.2	9	32.1	16	55.2
60–69	81	9.2	42	9.6	33	8.6	4	14.3	2	6.9
70 and over	1	0.1	1	0.2	0	0.0	0	0.0	0	0.0
Total	[2] 881	100.0	439	100.0	385	100.0	28	100.0	29	100.0
Smoking status										
Smoked	383	43.3	208	47.2	147	38.1	14	50.0	14	48.3
Denied smoking	500	56.6	233	52.8	238	61.7	14	50.0	15	51.7
Other	1	0.1	0	0.0	1	0.3	0	0.0	0	0.0
Total	[3] 884	100.0	441	100.0	386	100.0	28	100.0	29	100.0
Allergy status										
Claimed allergy	201	23.7	88	20.6	96	26.4	8	28.6	9	32.1
Denied allergy	646	76.7	340	79.4	267	73.6	20	71.4	19	67.9
Total	[4] 847	100.0	428	100.0	363	100.0	28	100.0	28	100.0

[1] Mean age of the 881 respondents to questions on age and occupation was 44 years; for cutters 43, for wrappers 44, for cutter-wrappers 48, and for "other" also 48.

[2] 17 respondents (1.9 percent of 898 total respondents) who failed to answer questions on age or occupation, or on both, are not included. Cutters comprised 49.8 percent of 881 remaining respondents, wrappers 43.7 percent, cutter-wrappers 3.2 percent, and "other" 3.3 percent.

[3] 14 respondents (1.6 percent of 898) who failed to answer questions on smoking status or occupation, or on both, are not included. Cutters comprised 49.9 percent of 884 remaining respondents, wrappers 43.7 percent, cutter-wrappers 3.2 percent, and "other" 3.3 percent.

[4] 51 respondents (5.7 percent of 898) who failed to answer questions on allergy status or occupation, or on both, are not included. Cutters comprised 50.5 percent of remaining 847 respondents, wrappers 42.9 percent, cutters-wrappers 3.3 percent, and "other" also 3.3 percent.

Table 4. Frequency of respiratory symptoms among the 898 respondents

Symptoms status	Cough		Sputum or phlegm		Wheeze		Shortness of breath	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Claimed symptom	308	34.3	277	30.8	122	13.6	198	22.0
Denied symptom	559	62.2	536	59.7	713	79.4	630	70.2
Other	0	0.0	1	0.1	0	0.0	0	0.0
Undeterminable	31	3.5	84	9.4	63	7.0	70	7.8

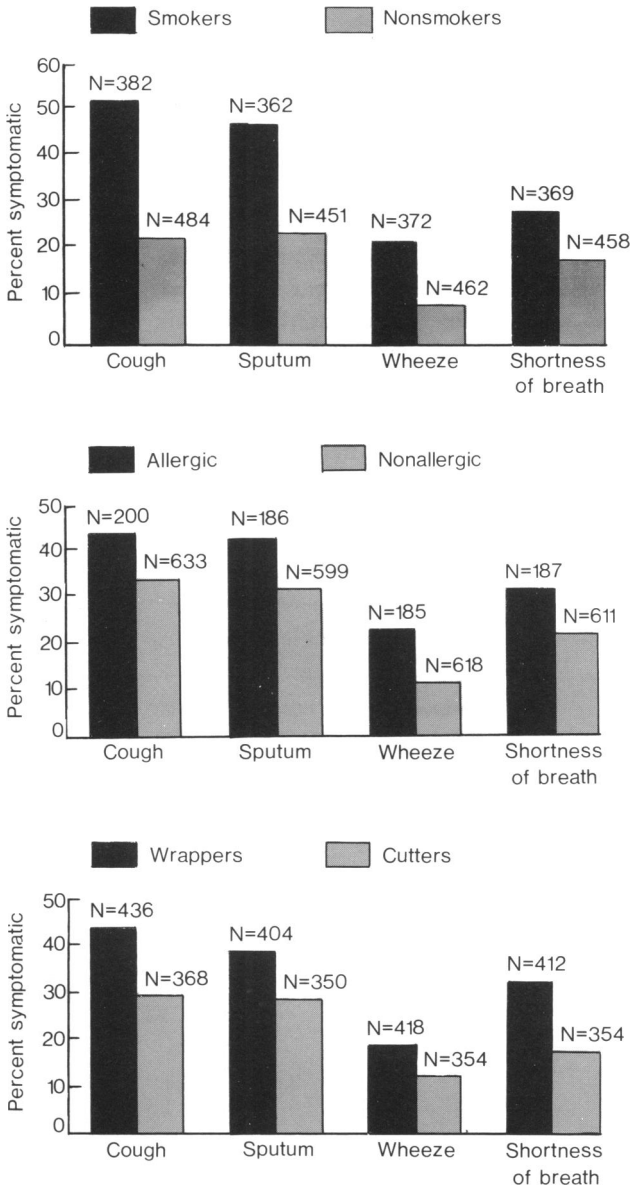
frequency of female respondents increased steadily with age, from 15.1 percent between 20 and 29 years to 33.1 percent between the years 50 and 59. In sharp contrast, male respondents were uniformly distributed in each age decile between 30 and 60 years. In the entire respondent population of retail meat department employees, the distribution of both men and women was generally uniform among the four decades from 20 to 60 years.

The age distributions of the two occupational groups were generally comparable, the greatest differences occurring in the 30 to 39 and the 50 to 59 year age ranges (table 3); the mean age for cutters was 43 years and for wrappers, 44 years.

With regard to current smoking and allergy status, the survey revealed that 43.3 percent of all the respondents smoked and 23.7 percent claimed an allergy. The mean age for smokers was 42 and of nonsmokers, 45. The mean age for allergic employees was 44 and for nonallergic employees, 43. As to smoking status and occupation, 38.1 percent (147) of the 386 wrappers and 47.2 percent (208) of the 441 meat cutters reported they smoked (table 3). When allergy status and occupation were analyzed together, 26.4 percent of the 363 wrappers and 20.6 percent of the 428 cutters claimed to have an allergy (table 3).

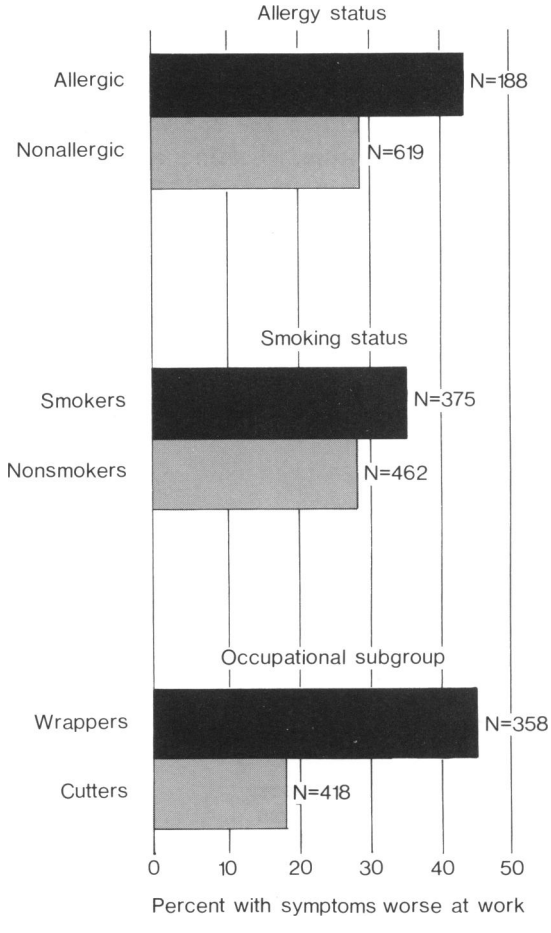
Respiratory symptoms in general. Cough, the most frequently occurring respiratory symptom, was reported by more than one-third of the respondents (table 4). Sputum production was noted by 30.8 percent, wheezing by 13.6 percent, and shortness of breath by 22.0 percent. Irrespective of work category, each of the four respiratory symptoms was more frequently reported by respondents with a history of smoking or allergy (figs. 1 and 2). When we considered work category alone, irrespective of a history of smoking or allergies, wrappers reported each respiratory symptom more often than cutters (fig. 3). In addition, we analyzed the distribution of each re-

Figure 1. Distribution of lower respiratory tract symptoms in retail meat department employees by smoking status, allergy status, and occupational subgroup



Note: N=total number of workers responding to question.

Figure 2. Distribution of respondents whose symptoms were worse at work, by allergy status, smoking status, and occupational subgroup



Note: N=total number of workers responding to question.

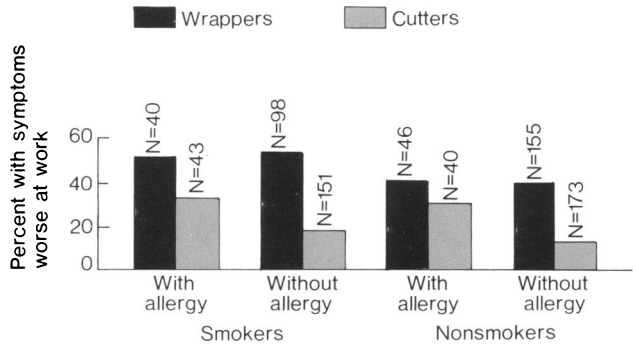
ported respiratory symptom in relation to the quantity of tobacco smoked. There was a concomitant increase in each symptom reported in respect to the quantity of tobacco smoked, a result that demonstrates a possible dose-response relationship (table 5).

Respiratory symptoms at workplace. Of the 898 respondents, 28.4 percent answered "Yes" to the question "Do you experience more cough, sputum, wheezing, or shortness of breath at work?" In contrast, 64.6 percent denied having any symptom that was worse at work.

Symptoms at workplace	*Number of respondents*	*Percent responding*
Experienced more cough, sputum, wheezing, or shortness of breath at work	255	28.4
Denied experiencing more cough, sputum, wheezing, or shortness of breath at work	580	4.6
Other	3	0.3
Undeterminable	60	6.7
Total	898	100.0

We made three comparisons of the respondents claiming they experienced "more" symptoms at work (fig. 2). When the meat cutters were compared with the meat wrappers in respect to respiratory symptoms, 44.7 percent of the 358 wrappers experienced more cough, sputum, wheezing, or shortness of breath at work. Interestingly, only 17.5 percent of the 418 cutters reported a similar experience. Therefore, the proportion of wrappers with symptoms that were worse at work was approximately 2.5 times greater

Figure 3. Distribution of meat wrappers and meat cutters whose symptoms were worse at work, by smoking and allergy status



Note: N=total number of workers responding to question.

when compared with the cutters ($P < 0.0001$, $\chi^2 = 68.2$, $df = 1$). In a comparison of smokers and nonsmokers, we found that 34.7 percent of the 375 smokers experienced symptoms that were worse at work, in contrast to 26.9 percent of the 462 nonsmokers ($P < 0.05$, $\chi^2 = 5.6$, $df = 1$). Of the 188 workers who claimed an allergy, 40.4 percent had symptoms that were worse at work, compared with 27.3 percent of the 619 workers who denied having an allergy ($P < 0.001$, $\chi^2 = 11.4$, $df = 1$).

In addition, the interrelationships of smoking, allergy, and occupation were analyzed. We divided the respondents into four subgroups for this analysis: smokers with an allergy, smokers without an allergy, nonsmokers with an allergy, and nonsmokers without an allergy (fig. 3). In each of these subgroups, wrap-

Table 5. Distribution of respondents by respiratory symptoms and reported amount of tobacco smoked

Respiratory symptoms	*Respondents who denied smoking*	*Respondents who reported smoking*					
		Packs of cigarettes per day				*Cigars*	*Pipe tobacco*
		½	*1*	*1½*	*2*		
Cough							
Percent reporting symptom	22.5	48.6	51.3	64.3	64.0	48.1	18.2
Total respondents to question	484	70	152	70	25	27	11
Sputum							
Percent reporting symptom	23.5	36.9	50.0	51.5	58.3	43.5	20.0
Total respondents to question	451	65	148	68	24	23	10
Wheeze							
Percent reporting symptom	8.4	18.8	22.7	28.6	33.3	28.0	0.0
Total respondents to question	462	69	150	70	24	25	9
Shortness of breath							
Percent reporting symptom	19.0	25.8	29.8	30.4	45.8	20.0	20.0
Total respondents to question	458	66	151	69	24	25	10

pers and cutters were compared with regard to their responses to the question "Do you experience more cough, sputum, or shortness of breath at work?" Among smokers with an allergy, 32.6 percent of 43 cutters and 52.5 percent of 40 wrappers experienced symptoms that were worse at work; the ratio of wrappers to cutters whose symptoms were worse at work was 1.6. Among smokers without an allergy, the ratio was 3.0 (17.2 percent of 151 cutters and 52.0 percent of 98 wrappers); among nonsmokers with an allergy, the ratio was 1.3 (30.0 percent of 40 cutters and 39.1 percent of 46 wrappers); and among nonsmokers without an allergy, the ratio was 3.3 (11.6 percent of 173 cutters and 38.7 percent of 155 wrappers), as shown in table 6.

For the subgroups with an allergy, we found that irrespective of smoking status, differences between wrappers and cutters for symptoms that were worse at work were not significant at the $P = 0.05$ level. For smokers and nonsmokers without an allergy, however, the differences were significant at the $P < 0.001$ level: for smokers without an allergy $\chi^2 = 32.1$, $df = 1$ and for nonsmokers without an allergy $\chi^2 = 31.6$, $df = 1$.

Discussion

Although only 25 percent of the retail meat department employees queried responded to our preliminary screening questionnaire, the consistency in the differences between wrappers and cutters in respiratory symptoms, irrespective of the symptom, is noteworthy.

We estimated that approximately 29 percent of 1,341 wrappers and 26 percent of 1,714 cutters in the retail department membership responded to the survey. The difference in the response rate was not statistically significant at the $P = 0.05$ level ($\chi^2 = 3.56$, $df = 1$). It is necessary to note, however, that a number of factors may have introduced bias into the respondent group. For example, meat wrappers may have identified more strongly with the publicized name of the syndrome under investigation ("meat wrappers' asthma") than meat cutters and, therefore, may have displayed greater interest and participated more in the survey. Before the survey, concern over the syndrome had been expressed in Union publications as a result of Sokol's report (*1*), and this concern may have had a greater impact on meat wrappers than meat cutters. It is also likely, as the data suggest, that meat wrappers have a higher frequency of respiratory symptoms and of symptoms that are worse at work than do meat cutters. Since persons who are symptomatic are perhaps more likely to respond to a survey effort than those who are not, a self-selection process may have occurred.

A comparison of the responders and nonresponders by work category revealed that the representation of cutters in each group was nearly the same (see "Results"). However, an inspection of job titles in the category "other" revealed that delicatessen workers and meat department managers constituted about 14 percent of the nonrespondent group, but only 3.2 percent of the respondent group. The disproportionately high number of workers in the non-

Table 6. Distribution of respondents who denied they smoked or had an allergy, by respiratory symptoms at workplace and occupation

Respiratory symptoms at workplace	Total		Cutters		Wrappers		Cutter-wrappers		Other	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Experienced more cough, sputum, wheezing, or shortness of breath at work	83	24.1	20	11.6	60	38.7	3	33.3	0	0.0
Denied experiencing more cough, sputum, wheezing, or shortness of breath at work	261	75.7	153	88.4	94	60.6	6	66.7	8	100.0
Other	1	0.3	0	0.0	1	0.6	0	0.0	0	0.0
Total	[1] 345	100.0	173	100.0	155	100.0	9	100.0	8	100.0

[1] Cutters comprised 50.1 percent of the 345, wrappers 44.9 percent, cutter-wrappers 2.6 percent, and "other" 2.3 percent.

responder group classified as "other" may have resulted from self-selection secondary to the absence of symptoms or from a failure of these workers to identify themselves with the population at risk. Nearly all the cutters were men, and nearly all the wrappers were women, regardless of their response status; there were also differences in the age distributions of the respondent and nonrespondent groups. Further clarification of the possible significance of the differences observed between respondents and nonrespondents must await completion of phase 2 of our ongoing investigations of this problem.

With these constraints in mind, we can say that the results of our preliminary survey suggest the following conclusions:

1. Meat wrappers, as a defined occupational group, demonstrate a greater prevalence of lower respiratory symptoms than meat cutters.

2. Smoking and allergy may contribute to respiratory symptoms among retail meat workers.

3. The fumes from polyvinyl chloride meat-wrapping film may partially account for the respiratory symptoms reported by wrappers, inasmuch as these workers (who generally experience a greater exposure to the fumes and work in closer proximity to their source) experienced symptoms that were worse at work approximately 2.5 times more often than cutters. Furthermore, this symptoms ratio increases when the two comparison groups are restricted to nonsmokers without an allergy. Then, we find that wrappers experienced symptoms that were worse at work approximately 3.3 times more often than cutters.

Additionally, it is estimated that the size of the particular occupational population at risk of exposure to these fumes in the United States and Canada is conservatively 125,000 employees (letter from John E. Boyd, vice president of Amalgamated Meat Cutters and Butcher Workmen of North America to Frank Cimino, president of District Union 427, dated October 29, 1975). The estimated occupational population at higher risk in the United States is between 25,000 and 47,000 meat wrappers. The results of this preliminary survey may also have implications in other industries in which workers are exposed to the pyrolytic products of polyvinyl chloride, either in film or in other forms.

Recommendations

In view of the consistency of these preliminary results and the large size of the population at risk, a comprehensive assessment of this asthma-like syndrome is needed. Such an assessment is warranted not only because of its direct significance to retail meat department employees, but also because of its possible implications for other occupational groups and the general population. We therefore recommend that a series of studies be conducted in a staged sequence as follows:

1. Further investigation of the observed asthma-like syndrome in retail meat department employees to validate the results of our preliminary survey. It is essential to complete a comprehensive assessment of the syndrome in a well-defined population for which records exist over long enough periods to facilitate both initial casefinding and followup. Based on the current results and subsequent findings, a succinct analytical epidemiologic protocol should be established so that the etiological factors can be more precisely defined.

2. A systems survey of the physical working environment, including layout, ventilation, processes, equipment, and materials in the work area. Such a survey is urgently needed to complement the epidemiologic studies now underway. It should include, but not be limited to, measurements of the work area temperature and relative humidity, as well as direct temperature measurements of the hot wire and cool ("cal") rod-cutting surfaces. The pyrolytic products of polyvinyl chloride and their chemical components, which may induce the observed adverse respiratory effects, also need to be identified.

3. An experimental protocol that can be used in identifying possible associations between the objective measurement of respiratory function and the subjective measurement of the symptoms of exposed workers. Development and implementation of such a protocol will require an estimate of the person-years of exposure to polyvinyl chloride fumes, the collection of medical, family, and work histories, and the use of diagnostic examinations such as pulmonary function tests.

4. Possibly a controlled challenge study. Upon completion of the systems survey and the establishment of an experimental protocol (items 2 and 3), such a study should be considered in order to define further the interrelationships of the factors responsible for the clinical symptoms and for the pathophysiology of the disease process.

5. Additional investigations of other occupational groups using the same kinds of wrapping material or techniques as the workers in our study (for example, workers engaged in the centralized packaging of cheese products and luncheon meats).

6. Initiation of a prospective epidemiologic protocol in a well-defined cohort of retail food industry employees. Such a protocol is needed because to date the period of exposure to polyvinyl chloride is relatively short, generally less than a decade. It would not only allow monitoring for early changes in the nature, extent, or severity of the currently identified syndrome but would also address the question of carcinogenicity.

Phase 2 of Study

A number of the aforementioned recommendations have already been incorporated into a second, more comprehensive epidemiologic survey, phase 2. This phase is now underway at the School of Medicine with the continued full cooperation of District Union 427. By means of "Respiratory Symptoms Questionnaire II," data are being collected on a randomly selected sample of retail meat department employees in northeastern Ohio. The sample is appropriately stratified to represent the respondents and nonrespondents identified in the preliminary survey. The study design of phase 2, however, places greater emphasis on smoking histories and on respiratory and allergic symptoms. In addition, the scope of the study has been broadened to include an analysis of two subgroups of workers: employees hired since the preliminary survey was initiated and employees who have terminated their employment since that time.

Significantly, the membership records of District Union 427 are complemented by a unique and extensive set of district health and welfare fund records, which have been made available for our studies. These records are continuing to provide background material and documentation for phase 2 and would be valuable in future studies. The accessibility of these Union records and the complete cooperation and participation of District Union 427 has afforded us this rare opportunity to dovetail sequentially epidemiologic and clinical studies with systems and engineering approaches, all in the same well-defined population group. Members of District Union 427 have consistently demonstrated their willingness to participate in these investigations.

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SYNOPSIS

FLEET, STEPHEN M. (Cleveland Metropolitan General Hospital), BARANCIK, JEROME I., and TUTHILL, TIMOTHY M.: *Respiratory symptoms of employees of retail meat departments. Preliminary results of a study in northeastern Ohio. Public Health Reports, Vol. 92, November–December, 1977, pp. 545–553.*

A study was conducted among the 3,550 members of District Union 427, Amalgamated Meat Cutters and Butcher Workmen of North America, to determine the prevalence of respiratory symptoms and the possible respiratory effects of exposure to the pyrolytic products of plastic meat-wrapping film. This occupational group includes nearly all retail meat workers who use, or work near, manual or automated wrapping equipment that produce fumes. In this group, meat wrappers, who work directly with polyvinyl chloride film and wrapping equipment, are consistently closer to the fume source than meat cutters.

A survey form mailed to the Union members contained questions on occupation, smoking, allergy, cough, sputum, wheezing, and shortness of breath. In an analysis of respiratory symptoms that were "worse at work," comparisons were made between meat wrappers and meat cutters, smokers and nonsmokers, and workers with and without allergies. Of the 898 initial respondents, 34.3 percent reported cough, 30.8 percent sputum production, 13.6 percent wheezing, and 22.0 percent shortness of breath. Symptoms that were "worse at work" were experienced by smokers 1.3 times as often as by nonsmokers and were experienced by workers with an allergy 1.5 times as often as by those without one.

Respiratory symptoms that were "worse at work" were observed 2.5 times more often among all wrappers than among all cutters. In a subgroup of nonsmokers without allergy, wrappers and cutters were also compared: wrappers reported symptoms that were "worse at work" 3.3 times more often than cutters.

These results support the hypothesis that exposure to a higher dose of fumes from plastic film is associated with a greater prevalence of lower respiratory symptoms.