

Occupational Skin Disease in Newspaper Pressroom Workers

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Studies of printing industry tradespeople have reported an increased problem of dermatologic abnormalities, including contact dermatitis and dermatitis attributed to solvent exposure. The current cross-sectional health survey of dermatological conditions were conducted in a follow-up of perceived skin abnormalities among newspaper pressroom workers. We surveyed 215 pressroom workers and 34 compositors at a large northeastern US newspaper printing facility. Our findings indicate that printing pressroom workers reported skin condition symptoms at a significantly higher rate than did the compositor referent group. Pressroom workers also were found to be at a significantly elevated risk of developing dermatitis after self-reported exposure to certain commonly used solvents. This emphasizes the need for proper work practices, product substitution where possible, and appropriate protective glove use by newspaper pressroom workers.

Newspaper printing is known to involve potential hazardous exposure to inks and solvents for workers who run the press operations. Although there have been mortality studies of newspaper pressroom workers,¹ there have been comparatively few studies of patterns of morbidity. Considering the 30 000 pressroom workers involved in the newspaper industry² and the variety of

substances used by these workers, there is a clear need to further examine disease relationships in this occupational group.

Dermatologic studies of printing industry tradespeople have shown frequent contact dermatitis and skin irritation among workers using inks and solvents.^{3,7} In addition, an increase in malignant melanoma has been noted among printing industry workers, especially those involved in processes that combine the use of ultraviolet radiation with dermal exposure to inks, solvents, and oils.^{4,5}

Initiated by perceived health and safety concerns, including skin conditions, this study was undertaken to investigate such potential adverse health outcomes in newspaper pressroom workers. We describe the dermatologic findings of a cross-sectional health survey conducted to evaluate the dermatologic health status of the pressroom workers at a larger newspaper.

Methods

Subjects

The eligible study population consisted of 248 full-time pressroom workers from a large newspaper printing plant located in the northeastern United States. Newspapers are printed at two plants, a main printing facility and a satellite plant. At the time of this survey, 203 individuals worked at the main printing facility, which also houses the administrative and composition offices (plant 1), and 81 were employed at the second plant (plant 2). All workers, members of the International Printing and Graphic Communications Union, were given the opportunity to participate in the study and were encouraged to do so by both union and management. A descriptive pamphlet was developed by the investigators and mailed to the workers before the

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0096-1736/91/3306-0711\$03.00/0

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commencement of the study to provide an understanding of what was involved and how the study results would be used. Two hundred fifteen pressroom workers chose to participate. In addition, 34 compositors, who worked at plant 1 but not in the pressroom, agreed to participate in the study as referents.

Job and Process Descriptions

Plant 1 has been in operation since 1955, and plant 2 has been in operation since 1984. Approximately 500 000 newspapers are printed weekdays, and over 750 000 are printed for the Sunday edition. Before 1977, plant 1 used the letterpress (raised surface) printing process, which included the handling of lead plates. Workers were exposed to inks as well as to ink mist thrown off by inking rollers. Cleanup involved the use of solvents, such as kerosene. The letterpress operation was phased out in 1976, and plant 1 was converted to the di-litho (lithographic) process. With the advent of di-litho operations, use of lead plates ceased. Di-litho printing involves the use of a plate treated chemically so that ink adheres only to the print image. Although generation of "ink fly" from high-speed litho presses is reportedly minimal, workers are exposed to di-litho and a wider variety of wash-up solvents than are workers in the letterpress operation.⁶ Di-litho operations were gradually phased out of plant 1 between 1979 and 1987 and replaced by the offset process. Plant 2 opened in December 1983 as an offset operation.

In the offset process, also a lithographic operation, a plate cylinder is sprayed by a fountain solution, then inked by an ink roller. The print image repels the solution and retains the ink for transfer to a blanket cylinder. The blanket cylinder then offsets the image to continuous printing stock.

Exposures among pressroom workers vary depending on the task performed. Workers progress through a series of positions on the working press. Entry level positions include the paperhandler, who feeds paper to the press, and the platehandler, who delivers and removes plates. Apprentice job responsibilities include oiling and greasing the press, splicing new paper rolls to old, and paper folding and alignment. Pressworkers

run the presses and set the ink adjustment. The floor supervisors (foremen) check the quality of the newspaper and may perform any of the other operators' tasks as necessary. All apprentice and pressman positions become involved in "plating up" the press (putting plates on printing cylinders). Job duties also vary by shift. Typically, the day crew "make ready" the presses by performing cleanup and maintenance, changing blankets and rollers, and the night crew operates the presses for newspaper production. An inventory of products regularly used in printing pressrooms is listed in Table 1. Their presence was confirmed by industrial sampling using standard NIOSH methods.⁸ By contrast, the compositors are responsible for composing the printed page and do not have contact with ink, lubricants, or cleaning solvents.

Questionnaire and Examination Procedures

A comprehensive health questionnaire was developed and mailed to all pressroom worker and compositor participants. Included were questions on work history, job description, past and recent exposures, organ systems, habits, and hobbies. Collection of data on job process and job description was intended to help provide an exposure assessment based on the employee's work history. Exposure questions included both recent and long-term use of solvents and other substances at work, at home, or as part of a hobby. Information on the frequency and duration of use of these substances was also obtained. The medical history included the health status of skin, nervous system, and other organ systems that were of specific interest in this survey. Finally, information concerning medications, habits, and hobbies was collected for evaluation as potential confounders. An interviewer reviewed the questionnaire for completeness.

Skin Examination

A skin examination was performed to obtain a medical evaluation of the worker's current skin condition. Examinations were performed on all participants in spe-

TABLE 1
List of Products Used in the Newspaper Printing Process

Aliphatic, aromatic, and chlorinated hydrocarbons
Cleansall (aliphatic hydrocarbons, pine oil, and surfactants)
Solvent type 1 (mineral spirits and naphtha blend)
Kerosene
Roller cleaner (aromatic and chlorinated hydrocarbons, alcohol)
Glycol ether containing solvents (usually less than 10%)
Plate cleaner (polyglycol ether and silicates)
All purpose cleaner (inorganic salts, diol ethers, and detergents)
Alkaline fountain solution (glycol ether)
Automatic blanket wash (aliphatic hydrocarbons and butyl carbitol)
Other
Variety of lubricants and oils (Mobil® 600 W) (refined mineral oil)
Variety of inks (mineral oil, carbon black, pigments, varnish, binding agent)
Isopropyl alcohol
Automatic blanket wash (aliphatic hydrocarbons and butyl carbitol)
Bleach

cially designated areas at each of the two plants before the start of the worker's shift. Examinations testing occurred over a 2-month period, from late October through early December 1988. Physicians performing the skin examination were not aware of the results of the questionnaire.

A standardized examination form was developed by occupational physicians for use in this study, with additional input from dermatologists with expertise in occupational skin disorders. The format consisted of an objective skin problems checklist, corresponding signs, sites of involvement, and relevant symptoms. Types of skin problems included contact dermatitis and other dermatitides, psoriasis, disorders of sebaceous glands, fungal infections, viral and bacterial infections, and neoplastic skin changes. Signs included erythema, macules, papules, cracks, and fissures. Sites of involvement were noted: scalp, face, trunk, arms, hands, groin, buttocks, legs, and feet. Relevant symptoms included statements regarding changes in the condition when away from work.

Substantial efforts were made to ensure uniform performance of the skin examination by the two examining occupational physicians (BY, DH). In addition to use of the skin examination protocol sheet and signs-and-symptoms checklist, each examiner received instructional training in contact dermatitis and occupational dermatoses before the survey. Workers were evaluated individually, in private rooms at each plant, by one of the examining physicians. Dermatitis was defined as the typical eczematoid rash. No distinction was made between acute or chronic eczematous dermatitis.

Statistical Methods

A statistical analysis of the data was performed by comparing the significance of means of the demographic statistics for pressroom workers and compositors using the two-tailed *t*-test for unpaired data. For the derma-

tologic analysis, χ^2 analysis of signs and symptoms and trend analysis of solvent contingency tables by degree of exposure and use of more than one solvent were performed to determine principal solvents of concern. Correlation coefficient analysis and logistic regression models were then developed using these selected solvents, as well as other candidate variables. A logistic regression model was constructed to examine the relationship between exposure and other variables to the prevalence of examination-confirmed dermatitis.

Results

Of the 249 workers who chose to participate in the survey, one pressroom worker did not return a questionnaire and was removed from the study. In addition, two nonwhite pressroom workers and one female compositor were removed from the analysis. As a result, 245 white, male workers were analyzed in total. The participating pressroom workers were representative of the total pressroom workers in age and years employed in printing. Pressroom workers differed significantly from compositors in age and work tenure (Table 2). Compositors were, as a group, older and had been employed at the plant longer. The pressroom workers, however, worked more overtime hours each week.

Comparison of skin signs and symptoms by questionnaire response, as shown in Table 3, indicated several significant differences between the pressroom and compositor groups. Pressroom workers reported dry or cracked skin (47.2%), itching (42.9%), or redness (35.4%) most frequently, although fewer than 20% of the compositors reported these conditions. Acne was reported by 16.5% of the pressroom workers but by none of the compositors.

Skin examination analysis revealed that 8.5% (18) of the pressroom workers and 3% (1) of the compositors had eczematous dermatitis. Most of the sites affected, 83.3% (15), were the hands or arms, and the remaining

TABLE 2
Descriptive Characteristics of the Study Population

Characteristic	Pressroom	Compositors	Student's <i>t</i>	P Value for 2-Tailed Test
Number of employees	212	33		
Mean age (y)	44.6 (13.2)*	54.2 (6.8)*	-4.101	<.001
Mean y in the trade	24.9 (13.1)*	31.4 (7.0)*	-2.82	<.01
Mean work wk/y	45.3 (6.1)*	46.4 (6.6)*	-0.905	NS†
(Pressroom N = 210)				
Mean h/wk	46.0 (8.6)*	37.8 (4.0)*	5.43	<.001
Frequency on disability	46.2% (98)	24.2% (8)		
(Pressroom N = 211)				
Frequency of process				
(Pressroom N = 197)	76.8% (152)	-		
letterpress				
(Pressroom N = 209)	93.8% (196)	-		
di-litho				
(Pressroom N = 208)	96.2% (200)	-		
offset				
Work at plant 1	150	33		
Work at plant 2	62	0		

* SD.

† NS = not significant.

TABLE 3
Frequency of Dermatologic Symptoms Reported by Workers*† (Pressroom N = 212; Compositors N = 33)

Skin Condition	Pressroom		Compositors		χ^2	P
	%	No.	%	No.		
Dryness or cracked skin	47.2	(100)	18.2	(6)	8.630	<.005
Itching	42.9	(91)	18.2	(6)	6.311	<.025
Acne	16.5	(35)	0.0	(0)	5.08	<.025
Hives	6.1	(13)	0.0	(0)	1.09	>.25*
Redness	35.4	(75)	15.2	(5)	4.432	<.05
Cuts or sores that heal poorly	13.2	(28)	9.1	(3)	0.145	>.50*
Frequent skin infections	5.7	(12)	9.1	(3)	0.140	>.50*
Skin discoloration	8.0	(17)	6.1	(2)	0.002	>.95*

* Within the past 12 months.

† Note: nonresponses were assumed to be a negative response.

TABLE 4
Frequency of Solvent Use and Dermatitis Prevalence (Pressroom Workers Only)

Frequency of Solvent Use (by Type)	Dermatitis		Total	Yes %	χ^2 Test for Trend*
	No	Yes			
Solvent type 1					
None	105	7	112	6.3	
<1/wk	47	5	52	9.6	T = 4.82 P < .05
>1/wk	18	5	23	21.7	
Total	170	17	187		
Cleansall					
None	50	1	51	2.0	
<1/wk	71	7	78	9.0	T = 4.21 P < .05
>1/wk	70	10	80	12.5	
Total	191	18	209		
Isopropyl alcohol					
None	67	2	69	2.9	
<1/wk	82	12	94	12.8	T = 1.88 P < .02
>1/wk	41	4	45	8.9	
Total	190	18	208		
Mobile® 600 wt oil					
None	85	5	90	5.6	
<1/wk	59	8	67	11.9	T = 1.00 P < .50
>1/wk	47	5	52	9.6	
Total	191	18	209		
LPC plate					
None	78	5	83	6.0	
<1/wk	82	10	92	10.9	T = .80 P < .50
>1/wk	28	3	31	9.7	
Total	188	18	206		
Kerosene					
None	30	3	33	9.1	
<1/wk	77	9	86	10.5	T = .52 P < .50
>1/wk	87	6	93	6.5	
Total	194	18	212		
All purpose cleaner					
None	65	5	70	7.1	
<1/wk	67	7	74	9.5	T = .37 P < .75
>1/wk	53	6	59	10.2	
Total	185	18	203		

* Responses of "not sure" are excluded from analysis.

three sites (16.7%) affected were the scalp or face. One compositor had an eczematous dermatitis of the face.

Further analysis of skin condition for the pressroom workers was performed to examine the relationship of confirmed dermatitis with exposure characteristics.

These included contingency table analysis of dermatitis status versus: job category, type of work performed, glove use, history of allergy, and self-reported use of each of seven solvents (Table 4).

No pressroom worker who was a platehandler or

paperhandler had eczematous dermatitis. Of the solvents reviewed for possible inclusion in a logistic regression model, χ^2 trend analysis of the contingency tables indicated that three solvents appeared to be most associated with dermatitis: Solvent Type 1, Cleansall, and isopropyl alcohol. Further analysis of the three identified solvents was performed to evaluate the use of more than one solvent, and this revealed a significant trend (Table 5). The additional independent variables of age, years in the printing trade, performance of maintenance work (maintenance and cleaning), use of gloves on the regular job, and history of allergy also were selected for possible inclusion in the logistic regression model, based on the possibility of association with dermatitis.

Correlation coefficient analysis of these variables revealed high correlation between age and years worked. The variable representing years worked in the printing trade was therefore considered redundant and removed. Logistic regression analysis was then performed on the remaining terms (Table 6). Evaluation of the significant variable reveals that the variable defined as "use of two or more of the solvents" is most related to probability of dermatitis with odds ratio (OR = 7.26 (1.54, 34.26)), followed by age with OR = 1.05 (1.01, 1.10). The remaining factors in the regression equation were not found to be significant ($P > 0.3$).

Other dermatologic findings included two cases of malignant melanoma in pressroom workers. On skin examination, malignant melanoma was suspected in one of the pressmen and subsequently confirmed. This man had a family history of melanoma. The second pressman, who reported the removal of a malignant melanoma, had prior occurrences of two unrelated malignancies and was undergoing chemotherapy. In both cases, the

histological type was confirmed to be superficial spreading and wide surgical incisions were performed. Analysis of other reported skin cancers revealed 2.4% (5) of the pressroom workers and 3% (1) of the compositors gave a history of skin cancer. All listed the type as basal cell carcinoma.

Discussion

Our findings suggest newspaper pressroom workers are exposed to substances that predispose to skin conditions. This finding appears to extend and confirm previous studies that indicate printing tradeworkers are at high risk for skin disease. Adverse dermatologic effects in printing industry workers are well-documented, with contact dermatitis, allergic as well as irritant, most often cited.^{3,9,10} In this study, several important findings stand out: a high proportion of skin signs and symptoms reported by pressroom workers, prevalence of dermatitis exceeding that of compositors, lack of this dermatitis in paperhandlers and platehandlers, the possible association of dermatitis with three of the solvents used at the newspaper, and the apparent lack of association with glove use, even though the hand was found to be the most commonly occurring site.

Although lack of dermatitis in compositors was expected because of the job tasks performed by these individuals (primarily computer work and page make-up), the absence of dermatitis in the paperhandlers and platehandlers is noteworthy. This would seem to be related either to the age of the worker, given the entry level of the job, or to the job activities performed.

TABLE 5
Use of Three Solvents and Dermatitis Prevalence (Pressroom Workers Only)

Solvents Use*	Dermatitis		Total	Yes %	χ^2 Test for Trend
	No	Yes			
0 of 3 used	35	1	36	2.8	T = 7.04 P < .01
1 of 3 used	42	1	43	2.3	
2 of 3 used	64	6	70	8.6	
3 of 3 used	53	10	63	15.9	
Total	194	18	212		

* Solvents include Solvent Type 1, Cleansall, and isopropyl alcohol.

TABLE 6
Logistic Regression Model for Dermatitis (Pressroom Workers Only): Analysis of Maximum Likelihood Estimates

Effect	Coefficient	SE	Probability	Odds Ratio (95% CI)*
Intercept	-5.992	1.47	.00001	7.26
Use at least 2 of 3 solvents†	1.983	0.79	.013	(1.54-34.26)
Age	0.0484	0.022	.026	1.05 (1.01-1.10)
Perform maintenance work	-0.545	0.54	.314	-
Told of allergy by physician	0.465	0.64	.465	-
Use gloves on regular job	-0.033	0.65	.960	-

* CI = confidence interval.

† Cleansall, Solvent Type 1, isopropyl alcohol.

Although the coefficient for age in the regression model is a significant factor (Table 6), the job activities of the paperhandlers and platehandlers, which involve minimal use of solvents, appear to be the key factor in the absence of dermatitis.

Contingency table and regression model results indicated several interesting findings concerning the three solvents of concern that we identified. When examined separately, frequency of use of Cleansall and Solvent Type 1 exhibited a statistically significant trend with dermatitis (Table 4), suggesting that more frequent use by workers was associated with greater occurrence of dermatitis. Although the isopropyl alcohol trend analysis was not significant, the greatly increased dermatitis when "no use" is compared with "occasional use" suggests a possible solvent combinatory effect deserving of greater exploration. Contingency table analysis of the combined effect of the three solvents revealed a statistically significant trend, and this was supported by the resulting strong regression model coefficient for solvent use and the solvent OR of 7.26 (Table 6).

Analysis of the characteristics of the three solvents may provide some insight as to possible synergistic effects. Solvent type 1 is made up of a mineral spirits and naphtha blend. Repeated or prolonged contact with mineral spirits and naphtha are irritating to the skin and may lead to dermatitis.¹¹ In addition, these chemicals dissolve the natural protective oils of the skin, disrupt the skin barrier, and make it easier for deeper penetration with subsequent absorption of chemicals through the affected area.¹² Cleansall is composed of aliphatic hydrocarbons, pine oil, and surfactants (detergents). Surfactants are known irritants. Aliphatic hydrocarbons are both irritants and defatters. Pine oil has been shown to occasionally sensitize the skin of workers.^{13,14} Finally, isopropyl alcohol is an irritant and a defatting agent.¹³ The irritant as well as defatting nature of the latter two solvents appears to be consistent with the contingency table analyses (Table 4), which suggest that only occasional use of Cleansall and isopropyl alcohols may result in an increase in dermatitis (multiple of 4.5 and 4.4, respectively, when compared with no use), although frequent use of solvent type 1 has the highest overall proportion of dermatitis (21.7%, and multiple of 2.3 when compared with occasional use). Also, given the indication that the proportion of dermatitis does not increase until two of three or three of three of the solvents are used by the worker (multiple of 3.1 and 5.7, respectively, when compared with no solvent use), a likely synergistic effect of these solvents should be considered. Such effects have been the subject of discussion in the literature.¹³

The low regression coefficient noted for glove use is also of interest, inasmuch as it appears to be anomalous with the expected protective effect of gloves. Review of those pressroom workers with dermatitis indicated that 78% (14/18) reported they wore gloves always or sometimes on their regular job, and 83% (15/18) wore gloves during maintenance and press cleaning. This is consistent with results for all pressroom workers (79% and 84%, respectively). Yet 71% (10/18) of the workers

with dermatitis who used gloves believed they were not completely effective, and the low regression coefficient and lack of significance for glove use could imply use of ineffective or inappropriate gloves by the worker. This finding was substantiated by confirmation that pressroom workers were supplied with latex gloves of cuff length. Latex gloves do not provide adequate protection against petroleum or oil-based solvents, many of which are used by pressroom workers.¹⁵ In addition, glove deterioration (swelling) after contact with solvents was noted by several workers. Neoprene and nitrile gloves are specified by glove manufacturers as providing protection from solvents and inks used in the printing trade.

In summary, our findings suggest that printing pressroom workers are at a significantly elevated risk of developing occupational skin disease, particularly after combined exposure to certain commonly used solvents. To minimize skin exposure and absorption of these substances, workers should avoid direct skin contact through proper work practices. The use of neoprene or nitrile glove materials that provide adequate protection against these substances should be encouraged. Barrier creams, lubricants, and nonabrasive soaps also could be used to help protect and return oils to the skin.

Acknowledgments

This study was funded by a grant from the Boston Globe, with the assistance of the Health Hazard Evaluation Program of the National Institute for Occupational Safety and Health and Grant ES-00002 from the National Institute of Environmental Sciences. We gratefully acknowledge the assistance of Marlys Rogers and Marcia Chertok in supervising field data collection and Janna Frelich for programming. We also thank the participants, Charles Downing and Eugene Butterfield of the Graphic Communications International Union—Local 3, as well as Henry Vitale and Frederick Harrington of the Boston Typographical Union 13 for their assistance. In addition, we thank Barbara Jonic, RN, and Dr Terrence O'Malley for their help. Drs Hashimoto and Yakes were supported by a National Institute of Environmental Health Sciences National Research Service Award 5 T32 ESO7069 from the Harvard School of Public Health.

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The Wages of Work—300 Dead Each Day

Since the passage of the Occupational Safety and Health Act of 1970, some 200 000 workers have been killed on the job in the United States and as many as 2 million more have died from diseases caused by the conditions where they worked. That's 300 dead men, women, and children every day. In fact, work kills more people each year than die from AIDS, drugs, or drunken driving and all other motor vehicle accidents.

Meanwhile, policing the problem is a nearly impossible task for OSHA. The nation has some 7 million workplaces, and more than half the 118 million workers labor in companies with fewer than a hundred employees. To inspect this vast domain, OSHA has about 1300 inspectors and a budget that has been eviscerated during the Reagan-Bush years. Adjusted for inflation, OSHA's current annual budget of \$285.2 million is less now than it was in the 1970s. For fiscal year 1981, workplace health received \$1 for every \$1579 in the federal budget; for 1991, it will receive \$1 for every \$2408.

From "The Wages of Work" by W. Serrin in *The Nation*, January 28, 1991.