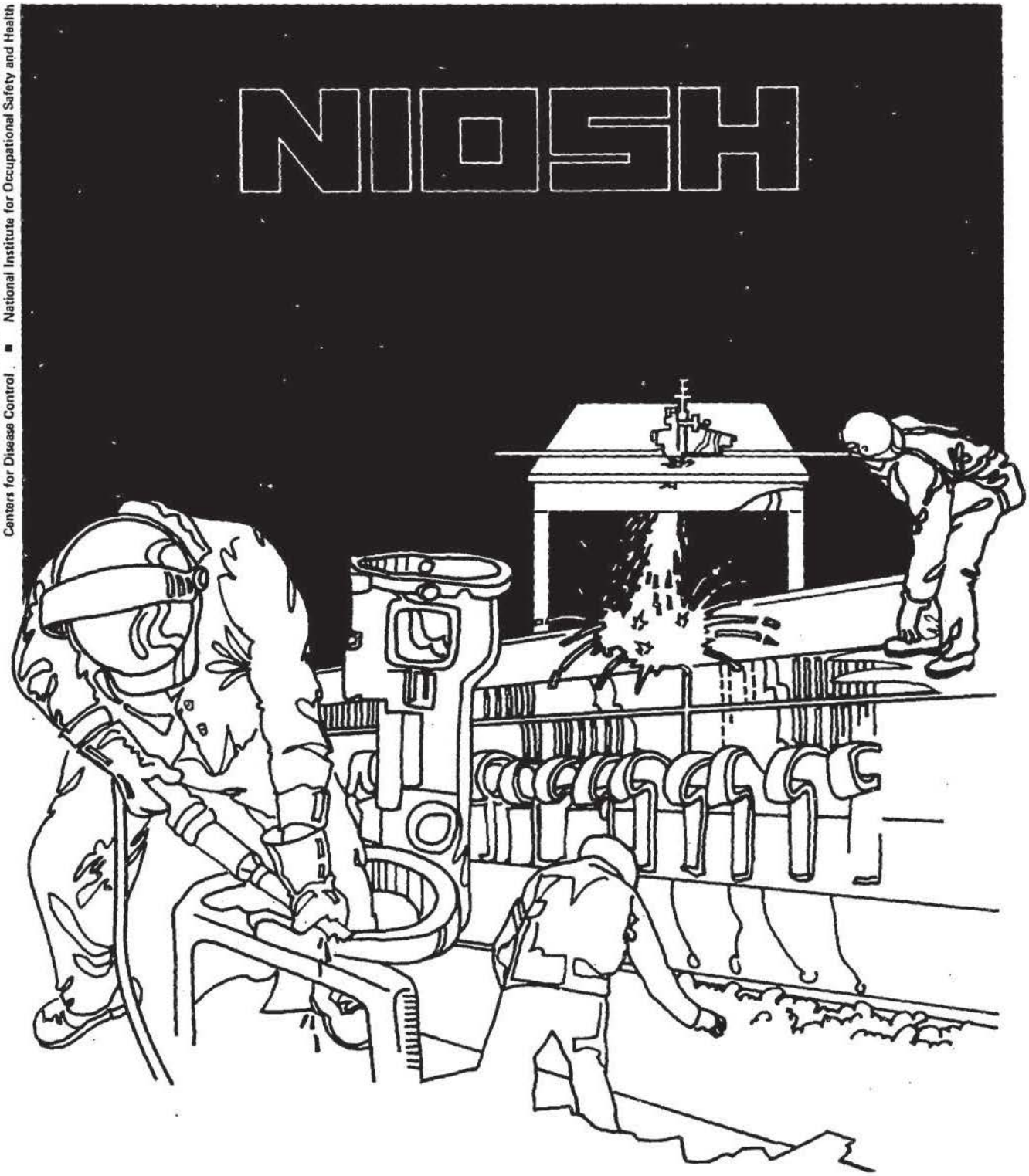
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES ■ Public Health Service
Centers for Disease Control ■ National Institute for Occupational Safety and Health

NIOSH



Health Hazard Evaluation Report

HETA 82-053-1263
BAY AREA HOSPITAL
COOS BAY, OREGON

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 nygiene 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 82-053-1263
FEBRUARY 1983
BAY AREA HOSPITAL
COOS BAY, OREGON

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I. SUMMARY

In November, 1981, the National Institute for Occupational Safety and Health (NIOSH) received a request from the employees at the Bay Area Hospital (BAH) to determine if the cleaning products used by the housekeeping staff were the cause of the contact dermatitis and respiratory problems experienced by the employees.

On January 14, 1982, the employees were interviewed and had a limited physical examination by a NIOSH physician. On April 5-7, 1982, environmental air samples were collected to determine the workers' airborne exposure to the cleaning products used. Phenols, which were present in the germicidal solutions used, can be absorbed through the skin and/or the vapors inhaled; therefore, post-shift urine samples were collected from the workers to determine the workers' excretion of phenol.

Workers' exposure to airborne vapors and mists of butyl cellosolve, cellosolve, ethanolamine, ethyl alcohol, formaldehyde and phenol were all below the detectable limits of the sampling and analytical methods used. Ammonia, carbitol, isopropyl alcohol, and petroleum distillates were all 4% or lower than the evaluation criteria. A change in the application of the cleaning compounds from spray bottles to the use of cleaning rags may have reduced the workers' respiratory exposure to these compounds during the past year.

Compared to eleven randomly selected controls from other areas of the hospital, the twenty-three housekeeping employees reported significantly more symptoms of cough, phlegm, itching of the external ear, sinus problems and symptoms of intoxication while at work. In addition, four housekeeping and one nursing employee had dermatitis of the hands and/or feet.

The mean urine phenol concentration for housekeeping employees was 26.5 mg phenol/gram of creatinine in the urine and for non-housekeeping employees was 9.8 mg phenol/gr creatinine in the urine. This difference is not statistically significant.

On the basis of the data collected from this evaluation, NIOSH has determined that the housekeeping employees have been exposed to chemicals, including phenolic germicides that may cause dermatitis. The persistence of severe dermatitis among several sensitized workers indicates that inappropriate contact with the chemicals continues. The absence of any new cases of dermatitis during the past year may be a result of changes made in the work practices that reduced skin contact with the chemicals. The low airborne concentrations of the chemical substances used shows that inhalation of these substances may not be the main route of absorption. Recommendations to further reduce or prevent contact with the cleaning compounds are included in this report.

KEYWORDS: SIC 8349 (Hospital Housekeeping), dermatitis, cleaning compounds, phenolics.

II. INTRODUCTION

In November 1981, NIOSH received a request from housekeeping staff employees of the Bay Area Hospital (BAH), Coos Bay, Oregon, to determine if the contact dermatitis and respiratory problems experienced by several of them were caused by the cleaning products they used. An initial environmental/medical survey was made on January 14, 1982, followed by an environmental survey on April 5-7, 1982 which included the collection of urine samples for measurement of phenol concentration.

III. BACKGROUND

A. Hospital Operations

BAH is a 172-bed, three-story, general hospital built in 1974. Thirty employees (three male and twenty-seven females) work in the housekeeping department on two shifts and are managed by a hospital housekeeping management company.

There are two basic jobs in the housekeeping department, i.e., general housekeeping (cleaning of the patient rooms, lobbies, hallways and office areas) and floor maintenance. The general housekeepers use the following products: a phenolic germicidal solution applied to all objects and floors; wall cleaner and degreaser; mirror and window cleaner; stainless steel cleaner; deodorizer (used in trash receptacles); ceramic and chrome cleaner; and aluminum polish. The floor maintenance employees use floor wax and floor wax stripper (applied several times per week) and floor wax restorer (used daily).

In the past, many of these items were applied using spray bottles. Now only the floor wax restorer and window cleaner are sprayed, and the other products are applied directly with cleaning rags. The cleaning solutions are usually mixed by the supervisors, with the exception of the germicidal solution, which is mixed by each user. The mixing ratio of germicidal solution to water commonly used in the past could not be verified.

The housekeeping staff have frequent contact with the phenol containing germicidal solution when mixing solutions, handling mops and pails, dumping the solution down the sink, cleaning on their hands and knees and wiping down beds. Solutions applied with toothbrushes to clean the TV bedside speakers and other items also produce aerosols in the employees' breathing zone.

The use of protective gloves was made mandatory just prior to the NIOSH environmental survey, and the cleaning solutions were applied with rags rather than spray bottles. These changes can greatly reduce the skin and respiratory problems associated with cleaning products. Also the management firm has substituted different cleaning products during the past year, some of which are similar to those replaced.

IV. EVALUATION DESIGN AND METHODS

A total of 34 workers participated in the initial survey on January 14, 1982. These included 23 of the 28 workers exposed to cleaning solutions in the Housekeeping Department, and 11 randomly selected unexposed

controls from the Business, Nursing, Food Service, and Supply Departments. All were administered a questionnaire and had a limited physical examination of exposed areas of skin, ascultation of the chest, and examination of the external ear by the NIOSH physician. The questionnaire elicited demographic information, information on social and past medical history, current symptoms, and occupational history. Medical records were obtained for those workers seen at the hospital.

During the environmental survey on April 5-7, 1982, measurements were made in the employees' breathing zone to determine exposure to airborne components of the products used. These include ammonia, butyl cellosolve, carbitol, cellosolve, ethanolamine, ethylene glycol, formaldehyde, isopropyl alchol, petroleum distillates, and phenol.

At that time, single urine samples were obtained from all available employees in the housekeeping department (late in the shift on a Tuesday), and from a control group of eight workers selected from Business, Food Service and Supply Department. Urine samples were also obtained from a second control group of eight unexposed NIOSH employees in Cincinnati.

A. Environmental Methods

Listed below are the sampling and analytical methods used in this evaluation:

Substance	Collection Method	Flow Rate	NIOSH Analytical Method (1)
Ammonia	Long term detector tubes	20 cc/min	Direct Reading
Butyl Cellosolve	Charcoal tubes	50 cc/min	P&CAM S-76
Carbitol	Charcoal tubes	150 cc/min	P&CAM 127
Cellosolve	Charcoal tubes	50 cc/min	P&CAM S-361
Ethanolamine	Silica gel tubes	150 cc/min	P&CAM 270
Ethylene Glycol	Silica gel tubes	150 cc/min	P&CAM 338
Formaldehyde	XAD-2 resin tubes	50 cc/min	P&CAM 354
Isopropyl Alcohol	Charcoal tubes	50 cc/min	P&CAM S-65
Petroleum Distillates	Charcoal tubes	50-200 cc/min	P&CAM 127
Phenol	Bubbler 0.1 N Sodium Hydroxide	1 lpm	P&CAM S-330

B. Medical Methods

The urine samples were analyzed by P&CAM Method No. 330, Phenol in Urine (1), and the results corrected for the urine creatinine. Phenol concentrations were detected using a Perkin-Elmer Model 900 gas chromatograph. The qualitative limit for phenol using this method is 0.5 mg/gr of creatinine in the urine. Dilute urine specimens (with urinary creatinine values less than 40 mg/1) were reported as "observed" phenol and excluded from the analysis, since extremely dilute urine may lead to erroneous corrected values.

The mean urinary phenol value of the exposed and unexposed groups were compared by using the Student Test for paired data.

V. EVALUATION CRITERIA

A. Environmental

The environmental criteria for exposure to toxic substances used in this evaluation are based on the following: 1. NIOSH Criteria Documents, Recommended Standards for Occupational Exposures; 2. Threshold Limit Values (TLV) of the American Conference of Governmental Industrial Hygienists (ACGIH); 3. The Oregon State Occupational Health Standards; 4. U.S. Department of Labor, OSHA, Standards.

Substance	NIOSH (or ACGIH) Recommended Criteria 10 hr TWA*	OSHA & Oregon Standards 8 hr TWA	Health Effects(2,3)
Ammonia	(NIOSH) 50 ppm 5 min ceiling (ACGIH) 25 ppm 35 ppm STEL***	50 ppm	Irritation of the eyes, respiratory tract, and skin.
Butyl Cellosolve-Skin	(ACGIH) 25 ppm	50 ppm	Eyes, nose, and throat irritation, skin absorption, hemolytic anemia.
Carbitol	None	None	Eye irritation.
Cellosolve	(ACGIH) 100 ppm	200 ppm	Eye Irritation, conjunctivitis.
Ethanolamine	(ACGIH) 3 ppm	3 ppm	Conjunctivitis, mucous membrane irritation, skin reddening, and dermatitis.
Ethylene Glycol	(ACGIH) 50 ppm ceiling	OSHA-None	Skin and upper respiratory irritation, conjunctivitis, fatigue, headache, and lethargy.

Substance	NIOSH (or ACGIH) Recommended Criteria 10 hr TWA*	OSHA & Oregon Standards 8 hr TWA	Health Effects
Formaldehyde	(NIOSH) Lowest feasible limit (suspected carcinogen) (ACGIH) 2 ppm ceiling	3 ppm 5 ppm ceiling	Conjunctivitis, eye irritation, upper respiratory irritation, skin sensitization, and dermatitis.
Isopropyl Alcohol	(ACGIH-NIOSH) 400 ppm	400 ppm	Skin irritation, conjunctivitis, headache, and fatigue.
Petroleum Distillates	(NIOSH) 350 mg/m	500 ppm	Dermatitis, folliculitis, hyperkeratosis, and comedomes.
Phenol - Skin	(NIOSH) 5 ppm 15 ppm 15 minute ceiling	5 ppm	Irritation of skin, mucous membranes, respiratory tract, and eyes.

*TWA - Time Weighted Factor
**S - Skin - potential contribution to the overall exposure by the cutaneous route
***STEL - Short Term Exposure Limit - 15 minutes

B. Medical

The compounds to which workers are exposed at BAH are common constituents of cleaning agents because of their solvent and disinfectant properties. Aromatic amines, alcohols, cellosolve, carbitol, ethanolamine, ethylene glycol, isopropyl alcohol and petroleum distillates are used as solvents and are components in lacquers, cleaners, polishes, and waxes. They may cause severe irritation of the skin with dermatitis by removing the protective oils in the outer layers (defatting). The more volatile compounds may be inhaled and cause headache, lethargy, and central nervous system depression. Formaldehyde and ammonia have antiseptic properties, but are also irritating to the skin, eyes, and upper respiratory tract.

Phenol is normally present in urine; it is a metabolite of various substances in the diet and in the environment. Individuals exposed to such substances as benzene, phenol, and phenolic compounds have an additional source of urinary phenol and thus might well have higher urinary phenol levels than people without these exposures. Urinary phenol is not a measure of any medical condition or disease and thus has no interpretation with respect to a person's state of health.

The question of what constitutes an "acceptable" level of urine phenol depends on the circumstances of exposure. Individuals without occupational exposure to phenol, or other phenolic compounds typically have urine phenol levels less than 20 milligrams per liter (or 24 or less mg/gram of creatinine in the urine). In the case of exposure to phenol or other phenolic compounds, some urine phenols may be anticipated.

For most phenolic compounds, there are no readily available data upon which to base a suggested acceptable urine phenol level. A level up to 300 mg/gram of creatinine or 250 milligrams per liter of urine has been proposed as an upper limit of acceptability for occupational phenol exposure.(4)

NOTE: (5)Several over-the-counter medications produce elevated urinary phenol levels. Pepto-Bismol contains phenyl salicylate and zinc phenyl sulfonate; Chloraseptic lozenges contain phenol and sodium phenolate. NIOSH has no knowledge whether or not any of the workers consumed these products on the day the urine samples were collected.

VII. RESULTS AND DISCUSSION

A. Environmental

All breathing zone air samples collected for butyl cellosolve, cellosolve, ethanolamine, ethylene glycol, formaldehyde and phenol contained concentrations below the limits of detection of the analytical methods used. One ammonia sample concentration was 1 ppm and three were below detectable limits. One carbitol sample was 1 ppm, and a second was below detectable limits. Three of four isopropyl alcohol samples were 0.3, 0.7 and 1.4 ppm. The other was below detectable limits. Two of nine petroleum distillate samples were 12 and 15 mg/cu m (collected when the housekeeper was cleaning the stainless steel walls of the elevator). The other seven were below detectable limits. All the samples in the survey that were positive were 4% or lower than the most stringent evaluation criteria used. Individual exposure results are shown in Tables 1-3.

B. Medical

The mean age, and the sex and racial distribution of the exposed workers was not significantly different than the controls and the mean number of years employed was the same (4.5 years). The mean number of days absent was greater in the Housekeeping Department (27 days/year) than in the control group (4 days/year) but the difference could be explained by chance alone ($T=1.49$, $DF=32$, $P=.14$). The frequencies of reported symptoms are reported in Table 4. There were statistically significant excesses in the reported prevalence of cough, phlegm, ear itching, sinus problems and symptoms of intoxication while at work among housekeeping employees compared to the control group. Typical case histories are presented in the Appendix.

One housekeeping worker with dermatitis was transferred to the linen department where her condition improved greatly, but it recurred on re-exposure to cleaning products. A second worker had dermatitis of the feet and trunk suggestive of contact sensitivity to rubber or dye in underwear or canvas rubber shoes. A third had severe dermatitis of the arms and legs and it was suggested that she be transferred to a job with no contact with cleaning materials.

C. Urine Phenol Results (Table 5)

The mean urine phenol concentrations for housekeeping employees was 26.5 mg phenol/gram of creatinine in urine (range 2.25 - 187 mg/l), and 9.8 mg phenol/gram of creatinine in urine (range 6.29 - 12.2) for the non-housekeeping employees. This difference is not statistically significant to ($T=.96$, $DF= 24$, $P=.65$). The mean concentration among the NIOSH controls was 14.5 mg/gram creatinine (range 7.38 - 43.7). Also the mean urine phenol of the housekeepers was not statistically different from that of the BAH controls combined with NIOSH controls.

D. Discussion

The environmental results obtained at the time of this investigation indicate that workers were exposed to airborne levels of the components of cleaning materials well below recommended criteria. There may have been heavier exposures in the past when products were applied with spray bottles. However, the solutions have very low vapor pressures and inhalation of the vapors or aerosols should not pose a problem when applied with a rag. However, direct skin contact may still present a hazard. Other constituents of these aerosols such as sodium metasilicate, trisodium phosphates, etc., were not sampled for.

The results of the medical survey suggest that Housekeeping employees had taken more sick days than other employees, and had more symptoms of upper and lower respiratory tract irritation, skin and ear itching, and intoxication from cleaning agents while at work. Ear itching is an unusual symptom and may represent a unique exposure situation, but this could not be linked to a single compound. Intoxication symptoms were particularly associated with floor stripping and use of the previously used wall cleaner compound in the elevators. Adequate ventilation when using this cleaner and avoiding direct skin contact will most likely prevent most of these symptoms.

The higher average urine phenol level in housekeeping employees, as compared to other hospital workers, reflects the exposure of housekeeping employees to phenolic compounds either by inhalation or through the skin. These tests do not indicate the presence or absence of disease in any individual or in the housekeeping workers as a whole, nor is the urine phenol level in any individual tested at BAH high enough to suggest, by itself, a toxic level of exposure. All measured levels (measured in mg/gram creatinine) were lower than suggested acceptable levels.

VIII. CONCLUSION

The housekeeping employees are exposed to a number of chemicals, including phenolic compounds, that can cause contact dermatitis. The persistence of the severe dermatitis in several sensitized workers indicates that excessive contact with the chemicals continues to be a problem. The fact that no new cases of dermatitis have occurred during the past year may be a result of changes in the work practices that have reduced skin contact with the chemicals. Recommendations for management of skin exposure and dermatitis in these workers are given below.

IX. RECOMMENDATIONS

1. All workers with contact dermatitis should be referred to a dermatologist.

2. Workers with contact dermatitis should be reassigned to a job with no exposure to the cleaning chemicals. After the dermatitis has resolved, the worker may then return to the housekeeping job under medical supervision, but with limited contact with the various cleaning compounds until the causative compound is identified.

3. Impervious gloves should be worn by the employees. Cotton-lined gloves or cotton liners can be used to reduce the problems caused by sweating. The inside of the gloves and the cotton liners should be washed daily.

4. Splashes or other contact with the cleaners used should be washed off immediately and contaminated clothing should be changed to prevent prolonged skin contact.

5. Consideration should be given to substituting quaternary ammonium disinfectants in place of phenolics.

6. The use of spray bottles to apply the cleaners should be avoided as they create a mist that can be inhaled.

7. All cleaning compounds should be mixed in ratios specified by the manufacturer.

8. When cleaning the elevator with the stainless steel cleaner, the elevator should be locked on a floor and the doors kept open, except during the time the doors are cleaned.

9. Workers with dermatitis of the feet should wear white, non-dyed socks and leather shoes.

10. Toothbrushes used to clean pillow speakers, etc., create a mist of the cleaning compound. An alternative method of cleaning should be investigated.

X. REFERENCES

1. NIOSH Manual of Analytical Methods, Vol. 1 - 7.

2. Chemical Hazards of the Workplace. Proctor N.H., Hughes J.P. Lippincott. 1978.

3. Occupational Diseases: A Guide to their Recognition. NIOSH Pub. (77-181).

4. Toxicology: The Basic Science of Poisons. Cassamett and Doull. Edited by Doull, J., MacMillan. Pages 705-707.

5. Elevated Urinary Phenol Levels not Related to Benzene Exposure: Fishbeck et al AIHA Journal, November 1975, pages 820-824.

XI. AUTHORSHIP AND ACKNOWLEDGEMENTS

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XII. DISTRIBUTION AND AVAILABILITY OF REPORT

Copies of this report are currently available upon request from NIOSH, Division of Standards Development and Technology Transfer, 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 the NIOSH Publications Office at the Cincinnati address. Copies of this report have been sent to:

1. Bay Area Hospital, Coos Bay, Oregon

2. United Food and Commercial Workers, Coos Bay, Oregon

3. Oregon State Accident Prevention Division, Salem, Oregon

4. U. S. Department of Labor, Occupational Safety and Health Agency (OSHA), Region X, Seattle, Washington

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

Appendix

Case Histories

Case 1 A female housekeeping employee with no history of allergies prior to beginning work at BAH 4 years ago. Two years ago, she developed dizziness, sore throat, difficulty talking, and a "sensation of head swelling" when cleaning the walls of the service elevator with "1,2,3 Wall Cleaner" using "high duster" and a spray bottle. In the emergency room she was told she had a "cold" and returned to work. Since that time, she complains of episodic feelings of "head swelling, sleepiness, heaviness" when using floor stripper or wall cleaner.

Case 2 A male houskeeping employee with no prior history of allergies or sinus problems who has worked at BAH for two years. He complains of sinus problems (constant nose running), itching of his ears, and feeling like "nearly passing out" with dizziness, feelings of incoordination, headache, "eyes drawn back," after using floor stripper.

Case 3 A female housekeeping employee who has worked at BAH for eight years with no prior history of skin problems. Since working at BAH, she has developed chronic reddening of the hands with scaly coating eruption on thumbs. She now wears surgical gloves while cleaning.

Case 4 A female housekeeping employee with no history of skin problems prior to beginning work at BAH six years ago. After six months of working with a disinfectant "Expose" she noted eruption of hands and face. She did not use gloves at the time and reported frequent contact with water containing "Expose." When the hospital switched to "germ warfare," containing phenolic compounds, she developed episodic re-eruption of her face and hands which was treated with cortisone cream. She now uses vinyl gloves, but has a rash on her arms and knees, which improves when she is off work.

Case 5 A female housekeeping employee with no history of skin rashes prior to beginning work at BAH five years ago. About one and one half years ago she developed a red scaly rash on both arms, legs and knees. She wore no gloves, worked on her knees, and was often exposed to disinfectants and cleaners. The rash disappeared after three weeks off work. Since that time she has been treated by a local dermatologist, but has been exposed to "Germ Warfare" which she associates with flare-ups of her rash.

TABLE 1

AMMONIA, BUTYL CELLOSOLVE, CARBITOL & CELLOSOLVE BREATHING ZONE AIR CONCENTRATIONS

BAY AREA HOSPITAL
COOS BAY, OREGON
HETA 82-053

JOB	DATE	SAMPLE NUMBER	SAMPLE TIME MIN.	SAMPLE VOL. LITERS	SUBSTANCE AND CONCENTRATION	PRESENT IN PRODUCTS USED
					Ammonia	Glass Cleaner
General Housekeeping	4-5-82	17	435	8.2	< 0.1 ppm	
General Housekeeping	4-5-82	18	460	8.4	< 0.1 ppm	
General Housekeeping	4-7-82	48	440	7.5	1.0 ppm	
General Housekeeping	4-7-82	49	440	4.4	< 0.1 ppm	
					Butyl Cellosolve (2-Butoxyethanol)	Glass Cleaner
General Housekeeping	4-5-82	3	425	15.3	< 0.2 ppm	
General Housekeeping	4-5-82	6	415	14.1	< 0.2 ppm	
General Housekeeping	4-7-82	44	435	14.5	< 0.2 ppm	
General Housekeeping	4-7-82	47	440	15.8	< 0.2 ppm	
					Carbitol (Diethylene Glycol Monoethyl Ether)	Floor Wax
Waxing Floors	4-5-82	21	18	1.0	< 2 ppm	
Waxing Floors	4-6-82	38	63	12.2	1 ppm	
					Cellosolve (2-Ethoxyethanol)	Floor Wax Restorer
Buffing Floors	4-5-82	8	395	14.5	< 0.2 ppm	
Buffing Floors	4-5-82	31	360	16.0	< 0.2 ppm	
Buffing Floors	4-5-82	50	340	13.0	< 0.2 ppm	

Limits of Detection: Ammonia - 0.1 ppm; Butyl Cellosolve - 0.01 mg; Carbitol - 0.01 mg; Cellosolve - 0.01 mg

TABLE 2

ETHANOLAMINE, ETHYLENE GLYCOL, FORMALDEHYDE & ISOPROPYL ALCOHOL BREATHING ZONE AIR CONCENTRATIONS

BAY AREA HOSPITAL
COOS BAY, OREGON
HETA 82-053

JOB	DATE	SAMPLE NUMBER	SAMPLE TIME MIN.	SAMPLE VOL. LITERS	SUBSTANCE AND CONCENTRATION	PRESENT IN PRODUCTS USED
					Ethanolamine	Floor Wax Stripper
Stripping Floors	4-5-82	14	67	4.3	< 0.9 ppm	
	4-5-82	25	40	2.5	< 1.5 ppm	
					Ethylene Glycol	Floor Wax
Waxing Floors	4-5-82	13	18	2.2	< 3.6 ppm	
Waxing Floors	4-6-82	36	60	4.1	< 2.0 ppm	
					Formaldehyde	Floor Wax and
Buffing and	4-5-82	15	395	10.7	< 0.06 ppm	Floor Wax Restorer
Waxing Floors	4-6-82	32	360	16.6	< 0.04 ppm	
	4-6-82	39	63	4.1	< 0.16 ppm	
	4-7-82	52	340	13.1	< 0.05 ppm	
					Isopropyl Alcohol	Glass Cleaner, Cream
General Housekeeping	4-5-82	1	430	15.7	0.3 ppm	Cleanser & Odor Control
General Housekeeping	4-5-82	4	405	14.2	< 0.3 ppm	Products
General Housekeeping	4-7-82	45	440	14.7	1.4 ppm	
General Housekeeping	4-7-82	46	440	12.9	0.7 ppm	

Limits of Detection: Ethanolamine - 0.01 mg; Ethylene Glycol - 0.02 mg; Formaldehyde - 5 mg; Isopropyl Alcohol - 0.01 mg

TABLE 3

PETROLEUM DISTILLATES AND PHENOL BREATHING ZONE
AIR CONCENTRATIONS

BAY AREA HOSPITAL
COOS BAY, OREGON
HETA 82-053

JOB	DATE	SAMPLE NUMBER	SAMPLE TIME MIN.	SAMPLE VOL. LITERS	SUBSTANCE AND CONCENTRATION	PRESENT IN PRODUCTS USED
					Petroleum Distillates	
Cleaning Stainless	4-5-82	22	38	8.1	12 mg/cu m	Stainless Steel Polish
Steel in Elevators	4-6-82	33	25	6.7	15 mg/cu m	" " "
General Housekeeping	4-5-82	2	425	18.3	< 6 mg/cu m	" " "
General Housekeeping	4-5-82	5	215	7.4	<14 mg/cu m	" " "
General Housekeeping	4-7-82	42	385	12.8	< 7 mg/cu m	" " "
General Housekeeping	4-7-82	43	435	18.4	< 6 mg/cu m	" " "
Buffing Floors	4-5-82	7	395	16.9	< 6 mg/cu m	Floor Polish Restorer
Buffing Floors	4-6-82	30	360	17.9	< 8 mg/cu m	" " "
Buffing Floors	4-7-82	51	340	13.1	< 6 mg/cu m	" " "
					Phenol	Germicide
General Housekeeping	4-5-82	19	415	415	< 0.01 ppm	
General Housekeeping	4-5-82	20	370	415	< 0.01 ppm	
General Housekeeping	4-7-82	40	450	450	< 0.01 ppm	
General Housekeeping	4-7-82	41	430	430	< 0.01 ppm	

Limits of Detection: Petroleum Distillates - 0.1 mg; Phenol - 0.01 mg

TABLE 4

FREQUENCIES OF SYMPTOMS REPORTED
HOUSEKEEPING DEPARTMENT VS OTHER CONTROLS

BAY AREA HOSPITAL
COOS BAY, OREGON
HETA-83-053

APRIL 1982

Symptom	Housekeeping (N=23)		Other (N=11)		Signif
	No.	%	No.	%	
Dyspnea on Exertion	10	43	3	27	N.S.
Cough	10	43	1	9	*
Phlegm	13	56	0	0	**
Ear Itch	14	61	0	0	**
Sinusitis	15	65	2	18	*
Nosebleed	7	30	1	9	N.S.
Frequent Colds	7	30	1	9	N.S.
Intoxication Symptoms	13	56	0	0	**
Skin Rash	8	34	2	18	N.S.

Fishers Exact Test:
*=p<.05
**=p<.01
N.S.=Non-Significant

TABLE 5

URINARY PHENOL CONCENTRATIONS (mgs/g OF CREATININE) OF
BAY AREA HOSPITAL EMPLOYEES EXPOSED TO GERMICIDE AND UNEXPOSED CONTROLS

BAY AREA HOSPITAL
COOS BAY, OREGON
HETA 83-053

APRIL 1982

Sample No.	Exposed Employees	Sample No.	Unexposed Employee Controls	Sample No.	Unexposed NIOSH Controls
1	187	31	10.1	1	9.40
2	51.5	32	Observed †	2	9.93
3	11.6	33	*	3	7.99
4	8.19	34	6.29	4	43.7
5	8.01	35	12.2	5	15.2
6	15.7	36	12.1	6	7.38
7	4.55	37	Observed †	7	10.4
8	3.14	38	8.41	8	12.3
9	3.77				
10	2.25	Mean	9.82	Mean	14.5
11	3.36				
12	Observed				
13	10.4				
14	14.6				
15	16.6				
16	34.1				
17	66.4				
18	4.70				
19	32.1				
20	29.3				
21	8.77				
22	19.7				
23	48.2				
Mean	26.5				

† Dilute urine sample (i.e less than 40 mgs creatinine per dl of urine) therefore expressed as "observed" phenol.

* Sample inadequate for determination

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