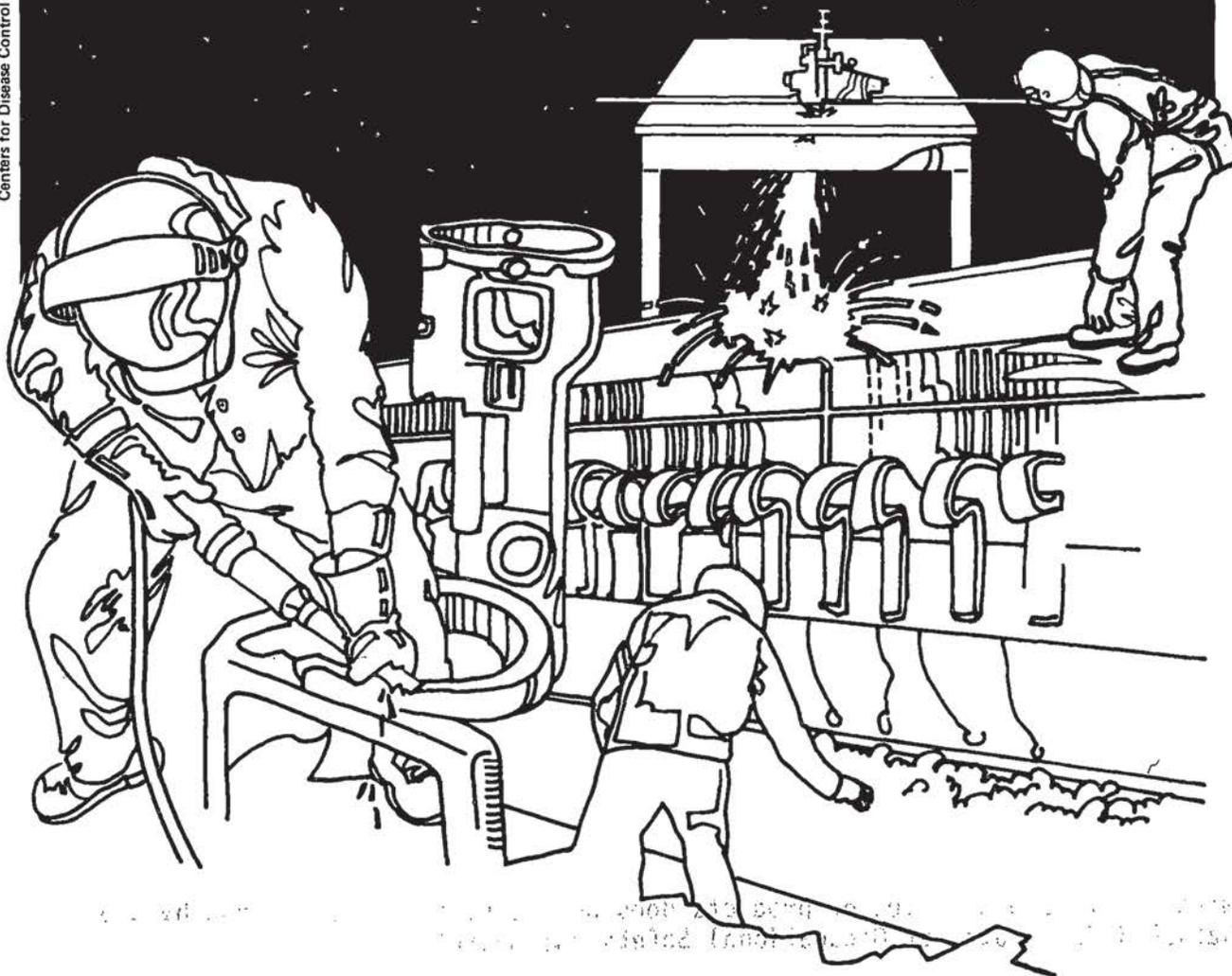


# NIOSH



## Health Hazard Evaluation Report

HHE 80-157-888  
LINCOLN MEDICAL AND  
MENTAL HEALTH CENTER  
BRONX, NEW YORK

## PREFACE

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

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

Mention of company names or products does not constitute endorsement by the National Institute for Occupational Safety and Health.

## I. SUMMARY

In May 1980, the National Institute for Occupational Safety and Health (NIOSH) received a request from an authorized representative of employees at the Lincoln Medical and Mental Health Center to evaluate potential exposures of dietary aides at the hospital. Concern was expressed that aides were being exposed to organic vapors as a result of heating food in plastic cookware using microwave ovens. Exposures reportedly resulted in rashes of the upper chest and face.

Quantitative analyses of heated bulk samples of the plastic cookware used in the pantries indicated that toluene, styrene, xylene, pentanes, and benzene derivatives could be released during heating. Analyses of bulk air samples collected in the pantries showed the presence of toluene, limonene, xylene and pinene. Personal breathing zone samples collected on employees during the initial (August 6-8, 1980) and follow-up (February 12, 1981) surveys detected trace quantities of toluene, styrene and limonene. Toluene concentrations ranged from non-detected (N.D.) to 0.1 ppm [permissible exposure level (PEL - 100 ppm)], styrene concentrations ranged from N.D. to 0.02 ppm and limonene concentrations ranged from N.D. to 0.66 ppm. Temperature readings during the initial survey averaged 83°F (Range 78° - 87°). The average relative humidity was 36% (Range 29% - 41%). Average temperature readings during the follow-up survey increased from 77°F (Range 75° - 79°) at 8 a.m. to 81°F (Range 77° - 86°) at 11 a.m. with the corresponding average relative humidity levels increasing slightly from 21% (Range 17% - 26%) to 22% (Range 16% to 30%).

During the initial survey 33 (69%) of the dietary aides were interviewed and of these 28 (85%) reported health complaints. The most frequently reported symptoms were skin and eye irritation, dizziness, and difficulty in holding items. On the follow-up survey, 11 workers were interviewed and examined by a dermatologist. Five had dermatitis present on examination. Three of these cases were judged not to be work related and two individuals had irritant dermatitis. Five additional workers had histories suggestive of irritant dermatitis. Six had or have had miliaria while working at the hospital which was judged to be a result of working in a hot, humid environment.

The dietary aides are experiencing adverse health effects but the cause(s) of the reported symptoms is still uncertain. Based on the data collected, it appears that a majority of health problems may be due to working in the hot, humid environment of the pantries. The environmental readings indicated that temperature and humidity levels increased during the preparation of meals and at times reached uncomfortable levels. Cases of primary irritant dermatitis and conjunctivitis were indicated by history. These problems could be a result of exposure to organic vapors. However, the concentrations of organic vapors measured during the time of this evaluation were below those levels previously reported to cause these symptoms. It is recommended that steps be taken to reduce the temperature and humidity levels. If these steps do not significantly reduce health complaints, additional changes may be required. Recommendation for reducing exposures are included in Section VIII of this report.

## II. INTRODUCTION

On May 27, 1980 NIOSH received a health hazard evaluation request from the American Federation of State, County and Municipal Employees, District Council 37 of New York City at the Lincoln Medical and Mental Health Center. The request concerned the potential exposure of dietary aides to organic vapors resulting from the heating of food on plastic cookware in microwave ovens. The workers reported experiencing rashes of the upper chest and face.

Interim reports were distributed in November 1980 and April 1981 reporting initial findings.

## III. BACKGROUND

Meals for patients are cooked in a central kitchen, arranged on trays by the kitchen workers and then transferred to the pantries for reheating and serving. There are 3 pantries on each floor for a total of 18 pantries. Each area contains an ice machine, a refrigerator, a small sink, a stove and 2 microwave ovens. Each pantry can serve a maximum of 40 patients.

The primary duties of the dietary aides are to reheat the meals and to distribute the meals to the patients. The patients meals are heated by placing covered crockery or plastic-coated paper plates (or styrofoam bowl) into the microwave ovens and heating for approximately 90 seconds. Each meal period the dietary aides spend about one and a half hours heating meals. Most aides serve two meals per workshift. At the time of the evaluation there were 48 dietary aides, 38 full time and 10 part time.

## IV. EVALUATION DESIGN AND METHODS

On August 6-8, 1980, NIOSH conducted an initial environmental survey in the pantries. Bulk material samples of the plastic cookware were collected for qualitative (gas chromatographic/mass spectrometric) analyses. Several personal breathing zone samples were also collected for organic vapors on charcoal tubes at a flowrate of 200 cubic centimeters per minute (cc/min). The samples were analyzed by GC procedures for organic vapors. Temperature and humidity readings were taken in some of the pantries.

A follow-up environmental evaluation was conducted on February 12, 1981. Bulk air samples for organic vapor analyses were collected on charcoal tubes at a flowrate of 1.5 liters/minute. Personal breathing zone samples for organic vapors were again collected. Humidity and temperature readings were also taken.

During the initial survey, 33 (69%) of the dietary aides using the microwave ovens were interviewed by a NIOSH medical officer concerning skin and eye complaints. A follow-up medical evaluation was conducted on March 9-10, 1981. Eleven workers, with histories of dermatitis, were examined by a NIOSH dermatologist.

V. EVALUATION CRITERIA

The environmental evaluation criteria for this study are presented in Table I. Listed in Table I, for each substance, are the recommended environmental limit, the source of the recommended limit, the principal or primary health effects underlying each recommended limit, and the current OSHA federal standard.

VI. RESULTS AND DISCUSSION

A. Environmental

The results of the quantitative analyses of the bulk material samples are presented in Table II. The results indicated when the styrofoam bowl was heated substances such as toluene, styrene and various pentanes were released. Pentane, xylene and benzene derivatives were identified when the plastic lids were heated. Similar compounds were found to be released from the plastic bowl. No detectable peaks were found when the plastic-coated paper plate and paper bowl were subjected to heat.

Analyses of the bulk air samples collected during the follow-up survey indicated the presence of minute quantities, of toluene, limonene, xylene and pinene.

Toluene, styrene and limonene were the only substances detected on the personal breathing zone samples collected on the initial and follow-up surveys. Toluene concentrations ranged from non-detected (N.D.) to 0.1 ppm (PEL - 100 ppm), styrene concentrations ranged from N.D. to 0.02 ppm (PEL - 100 ppm) and limonene concentrations ranged from N.D. to 0.66 ppm.

The average ambient temperature reading in the pantries during the initial survey was 83<sup>0</sup>F. Average relative humidity was 36%. On the follow-up survey, during preparation of breakfast the average temperature reading was 77<sup>0</sup>F and relative humidity was 21%. At lunch time the average temperature reading was 81<sup>0</sup>F and relative humidity was 22% (Table III).

B. Medical

During the initial survey, 33 (69%) of the dietary aides were interviewed. Of those 33 individuals, 27 were full-time employees and 6 were part-time employees. The workers' characteristics appear in Table IV.

Of the 33 workers interviewed, 28 (85%) reported symptoms. The symptoms reported most frequently were skin and eye irritation, dizziness and difficulty in holding items. Of those interviewed 26 had worked with microwave ovens for more than a year (mean duration 48.8 months). Of the 26, 24 (92%) reported one or more symptoms. Four of the remaining 7 workers with shorter job duration (4.6 months) also reported symptoms.

Table V tabulates the reported symptoms and indicates the prevalence among the long and short-term workers. Skin irritation was the most frequent complaint reported by 81% and 29% of the long and short term workers respectively (Table VI). The next most frequently reported symptom was eye discomfort at 73% and 39% respectively for the two groups, followed by skin rashes (46% and 4%) and nervousness (46% and 29%).

The symptoms reported through the questionnaires were also analyzed with respect to ages of the workers, location of pantries and number of meals prepared per shift. In all of these analyses the prevalence of symptoms was similar in all categories considered. By contrast, the analysis of symptoms by job duration yielded clear distinctions between the two groups of longer versus shorter job duration workers.

On the follow-up survey, 11 workers were interviewed and examined by a dermatologist. Five of the 11 had dermatitis present on examination. Three of the 11 were judged not to be work related. There were two cases of irritant dermatitis in the five cases with existing dermatitis. Five additional workers had histories suggestive of irritant dermatitis. Six of the 11 had or have had miliaria which was judged to be a result of working in a hot, humid environment.

## VII. CONCLUSIONS

The dietary aides are experiencing adverse health effects but the cause(s) of the reported symptoms is still uncertain. Based on the data collect, it appears that a majority of health problems may be due to working in the hot, humid environment of the pantries. The environmental readings indicated that temperature and humidity levels increased during the preparation of meals and at times, reached uncomfortable levels. Cases of primary irritant dermatitis and conjunctivitis were indicated by history. These problems could be a result of exposure to organic vapors, however, the concentrations of organic vapors measured during the time of this evaluation were not found at levels previously found to cause these symptoms. It is recommended that steps be taken to reduce the temperature and humidity levels. If these steps do not significantly reduce health complaints, additional changes may be required.

## VIII. RECOMMENDATIONS

1. The heat and humidity the dietary aides are exposed to should be reduced. Measures to insure adequate ventilation in the pantries should be instituted.
2. Microwave ovens, which exhaust from the rear, should be used to prevent direct eye/face exposure to the hot exhaust air. Microwave oven models that do not exhaust from the rear should be provided with deflectors to direct the heat away from the workers.

3. The microwave ovens should be relocated from the existing eye-level position. This should provide further protection from heat-related problems in addition to providing for some protection from any possible adverse effects to the eyes of the workers due to the microwaves.
4. All microwave ovens should be tested periodically for radiation leakage and immediate corrective action should be taken when indicated.

If health complaints continue after the above changes have been made, the following recommendations should be instituted.

1. The use of plastic cookware should be discontinued. Ceramic dishes, bowls and cups are recommended.
2. Plastic lids should be replaced with paper lids. If plastic lids must be used, they should be removed prior to heating and replaced before serving.

#### IX. AUTHORSHIP AND ACKNOWLEDGEMENTS

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X. DISTRIBUTION AND AVAILABILITY OF REPORT

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

1. Lincoln Medical and Mental Health Center
2. AFSCME, District Council 37
3. NIOSH, Region II
4. OSHA, Region II

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

Table I

Environmental Evaluation Criteria

Lincoln Medical and Mental Health Center  
Bronx, New York

HE 80-157

<u>Substance</u>	<u>Evaluation Criteria</u>	<u>Source</u>	<u>Primary Health Effects</u>	<u>OSHA Standard</u>
Toluene	100 ppm	NIOSH	Eye, respiratory tract and skin irritation	200 ppm
Styrene	100 ppm	OSHA	Eyes, nose, throat and skin irritation	100 ppm
Limonene	none		no known health effects	

Table II

Qualitative Analyses of Plastic Cookware

Lincoln Medical and Mental Health Center  
Bronx, New York

HE 80-157

<u>Item Description</u>	<u>Compounds Identified</u>
Styrofoam Bowl	Alkanes such as n-pentane, iso-pentane, and cyclopentane; Aromatics as styrene, ethyl benzene/xylene, and methyl ethyl benzenes.
Plastic-coated Paper Plate	All peaks too small for mass spectrometric identification.
Paper Bowl	No peaks detected except water.
Plastic Lid (small)	Pentane, toluene, styrene; Aromatics such as xylene/ethyl benzene, methyl ethyl benzene, and n-propyl benzene.
Plastic Bowl	Alkanes such as 3-methyl pentane, n-hexane, methylcyclopentane, and cyclohexane; Aromatics such as benzene, styrene, ethyl benzene/xylene, methyl ethyl benzene, and n-propylbenzene.
Paper Cup	No peaks detected.
Plastic Lid (large)	Pentane, toluene, styrene, ethyl benzene/xylene, and aromatics having a molecular weight of 120.
Serving Tray	Water, methanol, and possibly isopropanol.

Table III

Temperature and Humidity Readings Taken  
in Pantries During Meal PreparationLincoln Medical and Mental Health Center  
Bronx, New York

HE 80-157

February 12, 1981

Pantry Number	A*			B**		
	Temperature (°F) Wet Bulb	Temperature (°F) Dry Bulb	% Relative Humidity	Temperature (°F) Wet Bulb	Temperature (°F) Dry Bulb	% Relative Humidity
4B	54	75	23	57	80	22
4C	53	75	20	58	80	24
5A	53	78	15	56	79	21
5B	55	79	18	58	80	24
6A	55	77	22	61	81	30
6B	54	78	17	59	81	24
6C	55	77	22	57	81	20
8A	54	77	19	59	85	18
8B	55	79	18	57	80	22
8C	55	75	26	60	86	19
9A	56	78	22	58	85	16
9B	56	78	22	55	77	22

\*A = Readings taken between 8:00 and 9:00.

\*\*B = Readings taken between 11:00 and 12:45.

Table IV

Population Characteristics

Lincoln Medical and Mental Health Center  
Bronx, New York

HE 80-157

August 1980

<u>Group</u>	<u>Sex</u>		<u>Mean Age (Years)</u>	<u>Mean Job Duration (Months)</u>
	<u>M</u>	<u>F</u>		
A. Employed <u>over</u> than one <u>year</u>	1	25	52	48.8
B. Employed <u>less</u> than one <u>year</u>	2	5	36	4.6
C. Total sample	3	30	48.7	38.7

Table V  
 Symptoms Prevalence by Job Duration  
 Lincoln Medical and Mental Health Center  
 Bronx, New York  
 HE 80-157  
 August 1980

<u>Workers</u>	<u>Presence of Symptoms*</u>		<u>Absence of Symptoms</u>		<u>Total</u>
Workers, Job Duration <u>less</u> than 1 year	4	(57%)	3	(43%)	7
Workers, Job Duration <u>over</u> 1 year	24	(92%)	2	( 8%)	26
<u>Total</u>	28	(85%)	5	(15%)	33

Fisher's exact, P = .0479

\* The specific symptoms are listed in Table III.

Table VI

Relationship of Symptom to Job Duration  
 Lincoln Medical and Mental Health Center  
 Bronx, New York

HE 80-157

August 1980

<u>Symptom</u>	Workers with Job Duration over 1 year (N=26)		Workers with Job Duration less than 1 year (N=7)		Total Population	
	#	%	#	%	#	%
Skin irritation	21	81%	2	29%	23	70%
Eye discomfort	20	77%	1	14%	21	64%
Skin rash	12	46%	1	14%	13	39%
Nervousness/shakiness while working	12	46%	2	29%	14	24%
Difficulty in holding items	9	35%	0	0%	9	27%
Dizziness while working	8	31%	0	0%	8	24%
Throat irritation while working	7	27%	0	0%	7	21%
Headaches while working	6	23%	1	14%	7	21%
Nose irritation while working	4	14%	1	14%	5	15%
Absence of symptoms	2	8%	3	43%	5	15%

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