U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
CENTER FOR DISEASE CONTROL
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
CINCINNATI, OHIO 45226

HEALTH HAZARD EVALUATION DETERMINATION
REPORT NO. 79-106-635

BETH ISRAEL HOSPITAL LABORATORY
DENVER, COLORADO

DECEMBER 1979

I. TOXICITY DETERMINATION

A health hazard evaluation was conducted by the National Institute for Occupational Safety and Health (NIOSH) at Beth Israel Hospital Laboratory, Denver, Colorado, on June 14, 1979. At the time of this evaluation breathing zone and general room air samples were taken on workers for ethanol, formaldehyde, toluene, and xylene. A health hazard did not exist at this facility during the time of this evaluation. This laboratory has adequate ventilation that is used correctly by all workers.

II. DISTRIBUTION AND AVAILABILITY

Copies of this determination report are currently available upon request from NIOSH, Division of Technical Service, Information Resources and Dissemination Section, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days the report will be available through the National Technical Information Service (NTIS), Springfield, Virginia. 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. Beth Israel Hospital Laboratory
2. U.S. Department of Labor/OSHA - Region VIII
3. NIOSH - Region VIII.

For the purpose of informing approximately fifteen employees, a copy of this report shall be posted in a prominent place accessible to the employees for a period of 30 calendar days.

III. INTRODUCTION

Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6), authorizes the Secretary of Health, Education, and Welfare, following a written request by 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.

NIOSH received such a request from hospital management of Beth Israel Hospital, Denver, Colorado, to evaluate potential exposures associated with ethanol, formaldehyde, toluene, and xylene in the chemistry and pathology laboratories.

IV. HEALTH HAZARD EVALUATION

A. Processes Evaluated

All chemists, histologists, and laboratory technicians were working with a combination of either one or all of the following organic solvents: ethanol, formaldehyde, toluene, and xylene. These solvents are used in the analyses of the biological samples and in the preparation of tissue slides.

B. Evaluation Design

All workers were monitored for the particular solvent they were working with for the entire work period. Workers were also interviewed and asked question related to overexposures to these solvents such as: "Do you ever get sleepy while at work?"; "Do you develop headaches while at work?"; "Have you ever had abnormal liver function?"

C. Evaluation Methods

Ethanol, formaldehyde, toluene, and xylene were collected on organic vapor charcoal sampling tubes using vacuum pumps operated at 50 cc's per minute. The ethanol, toluene, and xylene samples were analyzed by gas chromatography. Formaldehyde samples were analyzed by ion chromatography.

D. Criteria for Assessing Workroom Concentrations of Air Contaminants

Three sources of criteria are generally used to assess workroom concentrations of air contaminants: (1) NIOSH criteria for recommended standards; (2) recommended Threshold Limit Values (TLVs) and their supporting documentation as set forth by the American Conference of Governmental Industrial Hygienists (ACGIH), 1979; (3) Occupational Safety and Health Administration (OSHA) standards (29 CFR 1910.1000), January 1978. NIOSH criteria and ACGIH TLVs represent the most recent and relevant recommendations and are given prominence in this evaluation.

Substance	Permissible Exposures 8-Hour Time-Weighted Exposure Basis (mg/M^3) NIOSH Criteria for Recommended Standard	TLV	Current OSHA Standard
Ethanol.....	1900	1900	---
Formaldehyde.....	3 (C)	6	1.2
Toluene.....	375	375	375
Xylene.....	435	435	435

C = Ceiling
mg/M^3 = milligrams of substance per cubic meter of air

Occupational health standards are established at levels designed to protect individuals occupationally exposed to toxic substances on an 8-hour per day, 40-hour per week basis over a normal working lifetime.

E. Toxicology

Ethanol is a colorless liquid with a vinous odor. Overexposures to ethanol causes depression of the central nervous system and liver damage. Ethanol also causes defatting dermatitis, headaches, dizziness, mental confusion, and fatigue. (Reference 1)

Formaldehyde is a colorless gas with pungent odor. It is highly toxic either by inhalation or ingestion. Formaldehyde is an irritant, produces local necrosis, and is a strong sensitizer. Formaldehyde dermatitis is often seen among workers who assist pathologists. Formaldehyde may also cause discoloration of the skin. Inhalation of formaldehyde may cause pulmonary edema, chest constriction, headaches, and asthmatic-type symptoms among sensitized individuals. (Reference 2)

Toluene is a clear, colorless, non-corrosive liquid with a sweet, pungent, benzene-like odor. Approximately 70% of all toluene that is produced is converted into benzene. Extreme caution when using toluene should be taken since it is often contaminated with benzene. It is dangerously absorbed both by inhalation and skin absorption. Toluene is an irritant, a central nervous system depressant, may cause liver damage and bone marrow suppression. Some of the common symptoms include defatting dermatitis, bronchitis, pneumonitis, nausea; vomiting, headaches, dizziness, and irritability. (References 3, 4)

Xylene overexposures may cause headache, nausea, gastrointestinal disturbance, and dizziness. Eye, nose, throat, and skin

irritation are also common complaints when workers are exposed to xylene. Workers exposed to xylene should have laboratory test for complete blood count, a routine urinalysis, and liver function test. (Reference 5)

F. Environmental Results and Discussion

Results of the environmental samples presented in Tables 1 and 2 clearly illustrate that workers are not overexposed since all breathing zone samples were below evaluation criteria. None of the workers had any exposures that would be detrimental to their health. Employee interviews did not show any data that would indicate possible overexposures.

V. RECOMMENDATIONS

1. All new employees should be briefed on the toxicity of ethanol, formaldehyde, toluene, and xylene.

VI. REFERENCES

1. Plunkett, E.R., Handbook of Industrial Toxicology, Chemical Publishing Company, New York, 1976, pp. 164-165.

2. Ibid., pp. 190-191.

3. Criteria for a Recommended Standard...Occupational Exposure to Toluene, HEW Publication No. (NIOSH) 73-11023, Cincinnati, Ohio, 1973.

4. Plunkett, pp. 412-413.

5. Criteria for a Recommended Standard...Occupational Exposure to Xylene, HEW Publication No. (NIOSH) 75-168, Cincinnati, Ohio, 1976.

VII. AUTHORSHIP AND ACKNOWLEDGMENTS

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TABLE 1

Breathing Zone and General Room Atmospheric Concentrations of
Ethanol, Toluene, and Xylene

Beth Israel Hospital Laboratory
Denver, Colorado

June 14, 1979

Sample Number	Job Classification	Location	Sampling Time	mg/M^3 Ethanol	Toluene	Xylene
1	Histology Technician	Histology Lab	7:40 AM - 11:00 AM	*	10	33
2	Medical Technician	Hematology Lab	7:48 AM - 11:00 AM	*	3	*
3	Chemistry Supervisor	Chemistry Lab	7:47 AM - 11:00 AM	*	*	3
4	General Room	Histology Lab	7:45 AM - 11:00 AM	*	*	3
5	Medical Technologist	Hematology Lab	7:50 AM - 11:20 AM	*	12	4
9	Histology Technician	Histology Lab	11:00 AM - 11:30 AM	*	6	4
10	General Room	Histology Lab	11:10 AM - 11:30 AM	*	9	21
11	Medical Technician	Hematology Lab	11:30 AM - 12:10 PM	*	*	5
		EVALUATION CRITERIA		1900	375	435
		LABORATORY LIMITS OF DETECTION mg/sample		0.10	0.01	0.02

* = below laboratory limit of detection

TABLE 2

Breathing Zone and General Room Atmospheric Concentrations of Formaldehyde

Beth Israel Hospital Laboratory
Denver, Colorado

June 14, 1979

Sample Number	Job Classification	Location	Sampling Time	mg/M^3 Formaldehyde
6	Pathologist	Histology Lab	1:10 PM - 2:00 PM	*
7	General Room	Histology Lab	1:10 PM - 2:00 PM	*
8	Histologist	Histology Lab	1:10 PM - 2:00 PM	*
		EVALUATION CRITERIA		1.2
		LABORATORY LIMIT OF DETECTION mg/sample		.004

* = below laboratory limit of detection