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. RHE 76-82-361

HAIR ZOO
PENFIELD, NEW YORK

FEBRUARY 1977

I. TOXICITY DETERMINATION

A Health Hazard Evaluation was conducted by the National Institute for Occupational Safety and Health (NIOSH) in the Nail Room at the Hair Zoo, Penfield, New York, on June 29, 1976. The intent of the survey was to determine whether exposures to monomeric methyl methacrylate (MMA) vapors were posing a health hazard to the employees. On the basis of air sample results, employee interviews, and available toxicity information it is concluded that exposures to MMA vapors did not present a health hazard to the employees at the time of the survey. It did appear (employee interviews) that dust resulting from the grinding of MMA polymer did cause, on occasion, a minor dermal effect through a simple mechanical irritant action. Recommendations to prevent this condition are presented in the text of this report. Air sampling for N,N-dimethyl-para-toluidine (the catalyst) showed only trace quantities.

II. DISTRIBUTION AND AVAILABILITY OF DETERMINATION REPORT

Copies of this report are available upon request from NIOSH, Division of Technical Services, 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 the NIOSH Publications Office at the Cincinnati address.

Copies of this report have been sent to:

1) Hair Zoo, Penfield, New York
2) Authorized Representative of Employees
3) U.S. Department of Labor - Region II
4) NIOSH - Region II

To "inform" the 3 affected employees, copies of the report shall be provided to these employees or the report shall be posted in a place prominent to these employees for a period of 30 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 an authorized representative of the employees, to evaluate the potential hazards associated with the use of MMA in the Nail Room at the Hair Zoo. The employer and employees at the Hair Zoo had been told by a competitor that MMA was extremely harmful. No adverse health problems or effects resulting from exposure to MMA were noted in the request.

IV. HEALTH HAZARD EVALUATION

A. Facility and Process Description

The nail department occupies a typical residential room of about 140 square feet (12' X 12'). The room is heated by forced air with supplemental baseboard electric heaters and cooled with a window air conditioner unit. Working within the room are 3 nail sculptors (technicians) on a full time basis. Each sculptor works at an individual table and sees one customer per hour or about 8 per day.

The process is simple in that MMA is used only for an artificial nail which is built up upon the natural nail of the customer using a small brush. Each nail requires a drop or two of monomer which has been mixed with an equally small amount of acrylic powder. The MMA vapors emanate from the liquid monomer up through the time that polymerization is complete (after brushing). After polymerization and "setting up" the artificial nail is smoothed and shaped with a small mechanically driven grinding wheel. It is during the grinding process that a small amount of dust can contact the arms, face, or torso of the nail sculptor.

B. Evaluation Methods and Results

Air samples for MMA (both breathing zone and area) were collected using MSA organic vapor charcoal tubes and Sipin personal sampling pumps operating at air flows of approximately 100 cubic centimeters of air per minute (cc/minute). Since air concentrations of MMA were judged to be low, larger-than-normal air volumes were collected. The results of the air sampling for MMA vapors are shown in Table I and indicate exposure levels well below those thought to be capable of exerting a toxic influence upon the exposed employees. A direct reading instrument (J-W Sniffer) indicated breathing zone MMA concentrations varying from 5 to 20 ppm, values consistant with the results of the charcoal tube sampling.

Primarily for academic interest, air samples for N,N-dimethyl-para-toluidine were taken in the same manner as for MMA except that SKC silica gel tubes were used as the collection device. It was expected that only trace amounts of the N,N-dimethyl-para-toluidine would be present, if any. This was confirmed by the air sample results presented in Table II. Both the charcoal and silica gel tubes were analyzed by gas chromatography.

The three nail sculptors were interviewed via a non-directed questionnaire to determine whether there were health effects implied by signs or symptoms and associated with exposure to MMA, either monomer or polymer. The results of these interviews were negative except that 2 of the 3 employees described itching and a raised rash which would occur on occasion (perhaps 5 to 6 times a month). This rash was usually on the face, arms, or exposed torso and would leave after washing well with soap and water. Presumably the rash was a simple mechanical irritant dermal response to the polymethyl methacrylate dust resulting from the grinding of the acrylic nails.

C. Evaluation Criteria

The only criteria available for this determination is the Threshold Limit Value (TLV) as published by the American Conference of Governmental Industrial Hygienists (ACGIH).[1] In 1965 the ACGIH recommended an exposure value of 100 parts of methyl methacrylate per million parts of air by volume (ppm) referring to a time-weighted average concentration for a 7 or 8 hour work day and a 40 hour work week. This recommended value is still current (1976). Documentation for the adopted value states: The TLV of 100 ppm is considered sufficiently low to protect against discomfort from irritation and is well below the level giving rise to any systemic effects.[2] The U.S. Department of Labor Occupational Safety and Health Administration (OSHA) has promogated the TLV of 100 ppm as the Federal Occupational Health Standard for methyl methacrylate.[3]

MMA vapor is an irritant to the skin and respiratory tract. Both the monomer and the polymer are reportedly capable of causing an allergic skin reaction. Dust produced from mechanically processing polymethyl methacrylate may also be irritating to the skin or may enter the eyes.[4] A recent study has suggested certain alterations in blood and urine biochemical parameters but resulting from exposure to concentrations of MMA vapor higher than those measured at the Hair Zoo.[5]

Current literature does not implicate MMA as a known carcinogen. The odor threshold of MMA is generally stated to be less than 1.0 ppm, a value giving ample warning of exposure.[6]

V. DISCUSSION-RECOMMENDATIONS

In view of the air sample results for MMA and N,N-dimethyl-para-toluidine, the employee interviews, and the literature review, it does not appear that control measures are necessary. It is felt that the rash described by the employees can be controlled by the following:

1) The employees should work with the arms and torso covered (e.g. long sleeves, full blouse, etc.)

2) Several times during the day, the employees should wash their hands and face with a mild soap and water to remove potentially irritating dust.

Barrier or protective creams have met with some success in preventing certain dermal conditions. The names and sources of several protective creams are listed in the Appendix should the employer and/or employees elect to try this approach for controlling the described rash.

VI. REFERENCES

1. American Conference of Governmental Industrial Hygienists. Threshold Limit Values for Substances in Workroom Air. Adopted by ACGIH for 1963. Cincinnati, Ohio 1963.

2. American Conference of Governmental Industrial Hygienists. Documentation of the Threshold Limit Values for Substances in Workroom Air. Ed. 3, Cincinnati, Ohio 1971.

3. U.S. Department of Labor, Occupational Safety and Health Administration. OSHA Safety and Health Standards (29 CFR 1910) OSHA 2206 (Revised January 1976) p. 507.

4. Encyclopedia of Occupational Health and Safety. Volume I, International Labour Office, Geneva, Switz., 1971, pp. 34-36.

5. Cromer, J. and Kronoveter, K. A study of Methyl Methacrylate Exposures and Employee Health. DHEW (NIOSH) Publication No. 77-119, Cincinnati, Ohio, Nov. 1976

6. Compilation of Odor and Taste Threshold Values Data. ASTM. W. H. Stahl, Editor. May 1973, P. 113.

VII. AUTHORSHIP AND ACKNOWLEDGEMENTS

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APPENDIX
SEVERAL COMMERCIALLY AVAILABLE PROTECTIVE CREAMS

Ply #9
Milburn Company
3246 E. Woodbudge
Detroit, Michigan 48207

West Protective Cream #211
West Chemical Products Company
42 - 16 West Street
Long Island City, New York

Kerodex #51
Ayerst Labs
685 - 3rd Avenue
New York, New York 10017

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

TABLE I

RESULTS OF AIR SAMPLES FOR METHYL METHACRYLATE

HAIR ZOO
PENFIELD, NEW YORK

JUNE 29, 1976

Time	Location	Sample Type	Methyl Methacrylate Concentrations (ppm)*
9:50-4:40	Desk 1	Breathing Zone	25
9:55-4:50	Desk 2	Breathing Zone	15
9:56-4:50	Desk 3	Breathing Zone	24
10:00-5:00	Window Sill	Area	13
10:00-3:40	By Refrigerator	Area	13

The ACGIH Threshold Limit Value and the U.S. Department of Labor standard for methyl methacrylate is 100 ppm for a 7 or 8-hour time weighted average daily exposure.

*Parts of methyl methacrylate per million parts of air by volume.

TABLE II

RESULTS OF AIR SAMPLES FOR N,N-DIMETHYL-PARA-TOLUIDINE

HAIR ZOO
PENFIELD, NEW YORK

JUNE 29, 1976

Time	Location	Sample Type	N,N-dimethyl-para-toluidine Concentrations(ppm)*
9:50-4:45	Desk 1	Breathing Zone	Less than 0.1
9:55-4:50	Desk 2	Breathing Zone	None Detected
9:56-4:40	Desk 3	Breathing Zone	Less than 0.1

*Parts of N,N-dimethyl-para-toluidine per million parts of air by volume.