

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 HE 80-1-654

COBE LABORATORIES, INC.
ARVADA, COLORADO

JANUARY 1980

I. SUMMARY

On November 15, 1979, the National Institute for Occupational Safety and Health (NIOSH) conducted a health hazard evaluation at Cobe Laboratories, Inc. in Arvada, Colorado, to evaluate possible hazards associated with an injection molding operation. This evaluation was requested to determine if two episodes of fainting experienced by an employee within a 3-week span of time were work-related. The materials used in the molding operation consist of ABS and polycarbonate resins, isopropanol, and a mold release which contains 1,1,1 trichloroethane with a freon propellant.

Personal breathing zone and area air samples were collected on charcoal tubes and analyzed by gas chromatographic and mass spectrometric procedures to identify the presence of air contaminants. In addition, all employees present on the day of the evaluation who worked in the molding area were interviewed.

Analysis of the environmental samples indicated the presence of 1,1,1 trichloroethane, isopropanol, and possibly small amounts of methylene chloride. No other compounds were detected. Isopropanol concentrations ranged from 9.5 ppm to 79 ppm (recommended permissible exposure limit, PEL - 400 ppm) and 1,1,1 trichloroethane concentrations ranged from 0.4 ppm to 3.6 ppm (recommended PEL - 350 ppm). The seven employees interviewed at the time of the evaluation reported no health problems. (The individual who had experienced the fainting episodes had left the company and was not among the employees interviewed.)

Based on the environmental sample results, employee interviews, and information collected during previous evaluations of similar molding operations, NIOSH determined that no health hazards existed in the molding room at Cobe Laboratories at the time of this evaluation.

II. INTRODUCTION

Under the Occupational Safety and Health Act of 1970*, NIOSH investigates the toxic effects of substances found in the workplace. The management at Cobe Laboratories requested such an evaluation from NIOSH to determine if any health hazards were present in the molding room. The workplace was evaluated by means of environmental samples, employee interviews, and information obtained from past NIOSH evaluations on similar operations.

III. BACKGROUND

Cobe Laboratories manufactures and markets medical therapeutic systems. The area of concern was the molding room where polycarbonate resin and acrylonitrile-butadiene-styrene (ABS) copolymers are molded according to standard injection molding procedures. The molding operations have been in existence for approximately 1 1/2 years and employ about seven workers per shift. All employees periodically rotate machines and work stations. The only other materials used in the area besides the resins are isopropyl alcohol and a degreaser which contains 1,1,1 trichloroethane with a freon propellant. Both materials are used to wash parts or the molds on an infrequent basis.

IV. EVALUATION DESIGN AND METHODS

Personal breathing zone air samples were taken on two mold operators using charcoal tubes at a flow rate of 200 cc/min. Two area charcoal tube samples were collected as close as possible to the molding head to determine maximum levels of contaminants being released. All samples were analyzed by gas chromatographic/mass spectrometric procedures. Ventilation and work practices were also evaluated. Employees present on the day of the evaluation were given non-directed medical questionnaires to determine work-related health problems.

* 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.

V. EVALUATION CRITERIA

The types of plastics used at Cobe Laboratories are generally regarded as biologically inert. As indicated in the literature, the major hazards associated with thermoplastics are from unreacted components used when manufacturing the polymers and from the effluent produced during thermal destruction of the plastics. The operations performed at Cobe Laboratories are not intentionally involved in either procedure. The most likely health problems associated with injection molding operations include irritation of the eyes, nose, throat, and upper respiratory tract from exposure to thermal decomposition products of the plastics and skin irritation resulting from contact with cleaning solvents. The plastic material must be excessively heated for decomposition products to be produced. This situation is usually immediately obvious because it produces an unacceptable product. If the plastic materials are excessively heated, such compounds as styrene, substituted benzenes, acrylonitrile, carbon monoxide, and hydrogen cyanide could be generated, with irritation being the most likely result.

Isopropyl alcohol vapors are mildly irritating to the conjunctiva and mucous membranes of the upper respiratory tract. Isopropanol is also potentially narcotic in high concentrations. The recommended permissible exposure limit is 400 ppm.

1,1,1 trichloroethane is mildly irritating to the eyes and mild conjunctivitis may develop. Repeated skin contact may produce a dry, scaly, and fissured dermatitis due to the solvent's defatting properties. 1,1,1 trichloroethane may act as a narcotic and depress the central nervous system. Acute exposure symptoms include dizziness, incoordination, drowsiness, and increased reaction time. NIOSH recommends a 350 ppm ceiling level for 15 minutes.

VI. RESULTS AND DISCUSSION

Results of the environmental sampling indicated that employees were not exposed to chemical substances at toxic levels during the time of this investigation. The only substances detected were isopropanol and 1,1,1 trichloroethane. The concentrations of both substances were well below recommended exposure limits (Table 1). No thermal decomposition products were detected. General ventilation (23-24 air changes per hour) should be adequate for normal operating conditions. The results of the employee interviews showed no reported health problems.

The environmental results found at Cobe are typical of those obtained at other injection molding operations.^{1,2} No detectable levels or very low concentrations of contaminants are found when molding processes are functioning under normal operating conditions. Obviously, the environmental results depict the quality of the work environment under the conditions that existed during the times of the evaluations. Alterations in a process could affect the quality of the workroom air. For example, higher temperatures during injection molding could increase the thermal decomposition of the plastic. It is, however, believed from review of the process that this fluctuation in temperature is not occurring at Cobe. The processing of plastics at temperatures that result in thermal decomposition usually results in a defective product. Therefore, temperature variations are usually obvious and corrected immediately. Due to the strict quality control required at Cobe, it is unlikely that the temperature during molding varies to any extent. It is also unlikely that only one person could have been affected by elevated concentration of decomposition products as all workers rotate molding machines and work areas periodically. Therefore, if one machine or area has a high concentration of contaminants, other workers would be expected to also have periodic health complaints. No other workers reported any health problems.

It should also be pointed out that fainting is not a typical reaction of exposure to decomposition products of plastics. The only other materials used in the area, isopropanol and 1,1,1 trichloroethane, are used at such limited quantities and so infrequently that the reported health problems would not result from exposure to these substances. Based on the information collected, it is believed that the health problems experienced by the one individual in the molding room were not work-related.

VII. REFERENCES

1. Price J., T. Thoburn, Health Hazard Evaluation Determination Report 76-60-398 National Institute for Occupational Safety and Health, June 1975.
2. Belanger P., W. Elesh, Health Hazard Evaluation Determination Report No. 79-36, National Institute for Occupational Safety and Health, January 1980.
3. Eckardt, R.E. and R. Hindin, "The Health Hazards of Plastics", JOM 15: 808-819 (1973).

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IX. DISTRIBUTION AND AVAILABILITY OF DETERMINATION 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), Springfield, Virginia 22161.

Copies of this report have been sent to:

- a) Cobe Laboratories, Inc., Arvada, Colorado
- b) U.S. Department of Labor, Region VIII
- c) NIOSH, Region VIII

For the purpose of informing the "affected employees," the employer shall promptly "post" the determination report for a period of 30 days in a prominent place near where exposed employees work.

Table 1
Isopropanol and 1,1,1 Trichloroethane Concentrations

Cobe Laboratories, Inc.
Arvada, Colorado

November 15, 1979

<u>Sampling Location</u>	<u>Sample Number</u>	<u>Sampling Time</u>	<u>Isopropanol (ppm)</u>	<u>1,1,1 Trichloroethane (ppm)</u>
T5 - Machine Operator	CT-1	13:40-15:44	9.5	3.6
T5 - Extruder Head Area	CT-2	13:40-15:44	10.6	1.8
T-2 Machine Operator	CT-4	13:40-15:42	79	0.5
T-2 Extruder Head Area	CT-3	13:40-15:42	20	0.4
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Recommended Permissible Exposure Limit			400	350