

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
CENTER FOR DISEASE CONTROL
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
CINCINNATI, OHIO 45202

HEALTH HAZARD EVALUATION DETERMINATION REPORT 74-73-233
GATES RUBBER COMPANY
DENVER, COLORADO

NOVEMBER 1975

I. TOXICITY DETERMINATION

Based on the results of environmental measurements, medical interviews, observations of work practices, and a review of the toxic properties of 4,4'-methylene bis (2 chloroaniline) or MOCA[®] and toluene 2,4-diisocyanate (TDI) it has been determined that a potential health hazard existed at the times (July 9-10, 1974 and December 3, 1974) when these evaluations were carried out in the Snowmobile Track Department (Department 97). Wipe samples taken throughout the Department indicated contamination with MOCA[®]. TDI airborne levels exceeded the Federal Standard in several instances. NIOSH recommends that the employer reduce airborne concentrations of TDI below 0.12 mg/M³. Since MOCA[®] is a suspected carcinogen, any exposure to this chemical is regarded as potentially hazardous.

II. DISTRIBUTION AND AVAILABILITY

Copies of this hazard evaluation determination are available upon request from the Hazard Evaluation Services Branch, NIOSH, U.S. Post Office Building, Room 508, Fifth and Walnut Streets, Cincinnati, Ohio 45202.

Copies have been sent to:

- (a) Gates Rubber Company
- (b) United Rubber Workers, Local #154, Denver
- (c) U.S. Department of Labor - Region VIII
- (d) NIOSH - Region VIII

This report should be posted in a prominent place accessible to the workers for a period of approximately 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.

The National Institute for Occupational Safety and Health received such a request from the President of United Rubber Workers, Local #154, Denver, Colorado, to evaluate the hazards associated with MOCAR[®] and TDI, which are used in the manufacture of snowmobile tracks.

IV. HEALTH HAZARD EVALUATION

A. Plant Process

The snowmobile track department of the Gates Rubber Company produces high quality urethane tracks for snowmobiles. These are made from pouring a mixture of TDI and MOCAR[®] into molds and then passing the molds by conveyor through a series of curing ovens. The TDI and MOCAR[®] systems are completely closed. However, entry of employees into the spincaster area is required for a brief period (15 to 30 minutes) each shift for equipment cleaning. Respirators are worn during this procedure. Because of the small number of employees each man carries out a wide variety of tasks throughout the entire Department area.

B. Evaluation Design

During this evaluation the snowmobile track department was not in full production due to economic conditions. Approximately ten men were employed in the Track Department when the initial phases of the evaluation began. TDI exposures were monitored by personal sampling techniques and general work area samples. Only one individual was sampled while carrying out the previously described in-oven cleaning activity (Table II, Sample 1). Ten minutes of the 62 minute sample time were spent in this activity. Wipe samples for the presence of MOCAR[®] were taken randomly from various assessable surfaces within the Department. Production had so slowed by the date when the medical portion of the evaluation was conducted, that only three employees were available for interview.

C. Evaluation Methods

TDI samples were taken by the Marcali method. These samples were analyzed colorimetrically. Wipe samples of MOCAR[®] were collected on paper, eluted with benzene, and analyzed colorimetrically.

Brief non-directed medical interviews and when deemed advisable limited cutaneous, eye, nose and throat examinations were carried out privately by a NIOSH physician within the work place on December 3, 1974.

D. Evaluation Criteria

MOCAP[®] is used as a cross-linker in various urethane plastic products. It was one of the fourteen substances covered by an Emergency Temporary Carcinogen Standard issued by the Occupational Safety and Health Administration on May 3, 1973. It is a proven potent carcinogen for rats and produces cancers of the kidneys, lungs, mammary glands, and liver in this species. The Emergency Standard was enacted based on this animal data and assumes that human exposure may possibly result in similar effects. To date no actual evidence of human carcinogenic activity has been reported. While this Standard has since been remanded by an Appeals Court decision the safety of human exposure to this substance remains to be established. Prudence, at this point in time, suggests that human exposures should be entirely avoided whenever possible. Skin absorption from direct contact is probably a major source of exposure and should be guarded against since low or absent airborne levels may instill a false sense of security.

TDI is the most commonly used industrial isocyanate and is widely used in the manufacture of "polyurethanes" or "polyurethane plastics." In high concentrations it is a potent pulmonary tract irritant. It also is capable of inducing an allergic pulmonary sensitization, which results in an asthma-like syndrome. Such sensitization occurs in only a relatively small proportion of exposed individuals, but once developed precludes any further contact with the substance. The current Standard is thought to be sufficiently low to prevent the development of sensitization.

The source of criteria used to assess workroom concentrations of TDI during this evaluation is the recommended threshold limit value (TLV) and its supporting documentation as set forth by the American Conference of Governmental Industrial Hygienists (1974). The following tabulation is taken from "Threshold Limit Values for Chemical Substances in Workroom Air Adopted by ACGIH for 1974."

<u>Substance</u>	<u>Permissible Exposures 8-Hour Time-Weighted Exposure Basis</u>	
¹ TDI	C--0.12 mg/M ³	(a)(b)

(a) C = ceiling value; this concentration shall not be exceeded for any period

(b) mg/M³ = approximate milligrams of substance per cubic meter of air

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

E. Evaluation Results and Discussion

1. Environmental Results and Discussion

All six wipe samples yielded measurable concentrations of MOCA[®] (Table I). As was previous indicated in Section D of this report the significance of human exposure to this substance has yet to be determined. In view of its carcinogenic potential for experimental animals it is deemed essential to minimize exposure as far as possible until further research determines safe exposure limits.

Four of eight personal breathing zone samples for TDI were found to be in excess of the recommended standard for this substance, which is a ceiling concentration (Table II). This indicates that a potential hazard for the eventual development of pulmonary sensitization exists for TDI. Since such sensitization may have severe health consequences for individuals who develop it, steps should be taken to reduce this hazard.

2. Medical Results and Discussion

Only three individuals were available for medical evaluation, a number far too small to draw any definite conclusions about. None of these individuals related symptoms of chest tightness, wheezing, nausea, vomiting, or weight loss which are commonly reported by persons with respiratory sensitization to TDI. One individual

did complain of "stuffy-nose" a symptom sometimes due to upper respiratory tract irritation or allergic forms of rhinitis. Another worker complained of a rash on his back which from its location and clinical appearance was determined not to be of occupational origin. The third worker gave a history of having had a laryngeal polyp which was apparently benign on removal. No other medical history or symptoms suggesting neoplasia were elicited.

F. Recommendations

1. The entire Snowmobile Track Department should be thoroughly cleaned to eliminate MOCA[®] contamination. If this were accomplished, it is doubtful that any MOCA[®] would be found, barring accidents, since the entire system is enclosed. However, periodic monitoring for this substance should be carried out. The proposed double locker-shower room facility will materially reduce skin contamination and prevent the escape of MOCA[®] into outside plant environments. The use of this facility should be made a condition of employment.

2. Adequate respirators should be worn by employees who must clean the spincaster equipment within the drying ovens since this is the operation which affords the greatest exposure to TDI.

V. AUTHORSHIP AND ACKNOWLEDGMENT

Report Prepared By:

Bobby J. Gunter, Ph.D.
Regional Industrial Hygienist
NIOSH - Region VIII
Denver, Colorado

James B. Lucas, M.D.
NIOSH Medical Officer
Cincinnati, Ohio

Originating Office:

Jerome P. Flesch, Chief
Hazard Evaluation Services Branch
Cincinnati, Ohio

TABLE I

Wipe Sample Concentrations of
4,4'-Methylene-bis-(2-chloroaniline)
(MOCA[®])

Gates Rubber Company
Denver, Colorado

July 9, 1974

<u>Area</u>	<u>Sample Number</u>	<u>4,4'-Methylene-bis-(2-chloroaniline) (MOCA[®]) µg*</u>
East end of cell 1	1	11
Hypotherm	2	82
South side of cell 1	3	65
Cell 1 assembly	4	40
Cell 1 oven heating unit	5	5
Cell 2 admiral unit	6	44
HYGIENIC STANDARD		**(no detectable level)

*µg = Micrograms

**Workers should not be exposed to MOCA[®], since it is a suspected carcinogen

TABLE II
Breathing Zone and General Room Concentrations of
Toluene Diisocyanate (TDI)

Gates Rubber Company
Denver, Colorado

July 10, 1974

<u>Sample Number</u>	<u>Job</u>	<u>Sample Volume (liters)‡</u>	<u>Toluene Diisocyanate (TDI) mg/M³</u>
1*	Process Operator	62	0.15
2	Process Operator	63	0.09
3	Inspector	56	0.07
4	Inspector	54	0.06
5	General Room	49	0.04
6	General Room	81	0.03
7	Process Operator	57	0.14
8	Process Operator	57	0.23
9	Inspector	56	0.10
10	Inspector	59	0.14
HYGIENIC STANDARD			0.12 "C"

*Ten minutes of this sampling time represents exposure within the spincaster oven while cleaning equipment.

"C" - ceiling concentration and shall never be exceeded for any length of time.

‡ All samples were collected at a flow rate of one liter/minute.