

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

HEALTH HAZARD EVALUATION DETERMINATION REPORT
HE 79-154-735

SUPERMARKETS GENERAL, INC.
WOODBIDGE, NEW JERSEY

AUGUST 1980

I. SUMMARY

The National Institute for Occupational Safety and Health received a request to investigate a case of irritation and disorientation associated with use of a company automobile.

On September 28th a representative of NIOSH interviewed the employee to whom the automobile had been assigned. From the onset of use of the automobile he complained of symptoms of headache, nausea, disorientation and difficult breathing which began upon entering the auto, even before the ignition had been started. The employee had no history of allergies, and did not exhibit similar symptoms in other automobiles or anywhere else. The symptoms were relieved after leaving the automobile.

Samples were collected on September 28th 1979 and April 17, 1980 to evaluate air-borne contaminants inside the passenger compartment. The samples for organic contaminants were analyzed by NIOSH's standard gas chromatographic method. Traces of the following chemicals were detected - xylene, toluene, trimethyl benzene, high molecular weight phenyl alkanes (such as phenyl undecanes and phenyl dodecanes) and, tentatively, 2,6 di-tertirary butyl para benzoquinone and di-tertiary ethyl phenone. All of these compounds were found in extremely small amounts. Toluene, the most abundant, was present in concentrations less than 0.05 microgram per cubic meter of air. No formaldehyde was detected. No carbon monoxide or oxides of nitrogen were detected. Carbon dioxide concentrations were well within acceptable limits.

The concentrations of chemicals detected are less than would be expected to produce the degree of clinical effects which occurred in this case except in a highly sensitive individual. The abatement of symptoms with time, despite continued exposure in the automobile suggests that the etiological factors in this case were chemicals which out-gassed from the plastics in the passenger compartment, and which are gradually being reduced with time.

II. INTRODUCTION

On September 30, 1979, the National Institute for Occupational Safety and Health received a request from an employee of Supermarkets General, Inc. (SIC 5411) asking for an investigation to determine a possible cause of

his symptoms which occur when occupying a company automobile.* The employee experienced episodes of headache, nausea, labored breathing and dizziness when entering or after driving or riding in the automobile.

III. BACKGROUND

The automobile, which was leased from a local dealer, is a 1979, two door Chevrolet Malibu. The employee was assigned the car in March, 1979 and immediately began experiencing the difficulties described previously. The car was examined by the dealer and exhaust system problems were ruled out. The employee stated that he was affected by symptoms even before the automobile's ignition was turned on, and that driving the car with windows open would lessen the symptoms. Other employees who occasionally rode in the car sometimes would mention that they detected an unusual odor, but they never were affected to the extent of the employee to which the car was assigned. This employee did not have a history of allergies. He switched to using his own automobile for a time and then resumed use of the automobile in question. The symptoms have been abating and he was symptom-free at the time of the last visit (April, 1980). He stated that the only time that symptoms might recur would be upon entering the automobile after it had been parked in sunlight for a period of time.

IV. METHODS

The Chief of General Motors' Industrial Hygiene Laboratories was consulted. She stated that they were not aware of any widespread complaints of this nature but suggested that phenol/formaldehyde outgassing from insulation materials may be a possible source.

Sampling for organics was conducted on September 28th, 1979; outdoor temperature was approximately 80°F, inside temperature 95-100°F. The NIOSH investigator detected a slightly acrid odor not usually associated with a "new car smell." This odor was not apparent during the revisit in April, 1980. Qualitative tests were made for formaldehyde by using personal air sampling pumps (at approximately 100 cubic centimeters of air per minute for 30 minutes) as a suction source to draw air through detector tubes. No formaldehyde could be detected. Samples also were collected for organic chemicals. Air was drawn for several hours through glass tubes containing activated charcoal. The charcoal was desorbed with carbon disulfide and analyzed by NIOSH's standard gas

*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 and Human Services, following a written request by an employer or authorized representative of employees, to determine whether any substance in the place of employment might have potentially toxic effects as it is used or may be found.

chromatographic method. Although sample concentrations were extremely low, the following identifications were made: the total concentrations of all contaminants were less than 0.1 milligrams for a 100 liter sample. Toluene, the largest single component was present at about 5 micrograms per 100 liters. Other components identified were: xylene, a few unspecified aliphatic hydrocarbons and a few higher molecular weight aromatics such as trimethylbenzenes (molecular weight about 120). A series of higher boiling components tentatively were identified as high molecular weight phenyl alkanes such as phenyl decanes, phenyl undecanes and phenyl dodecanes; and (perhaps) 2,6 di-tertiary-para-benzoquinone and di-tertiary-butyl-ethyl phenol. These compounds were only tentatively identified since their concentrations were so low.

On April 17, 1980, detector tubes were used to determine concentrations of carbon monoxide (CO), carbon dioxide (CO₂) and oxides of nitrogen (NO and NO₂) which might seep into the passenger compartment while the engine was in operation. Determinations of carbon monoxide and oxides of nitrogen were made after 5, 15 and 30 minutes with the ventilation system off; the ventilation system fans on low (flow-through system); air conditioning system in operation (medium cooling, medium fans); heating system in operation (medium heating, medium fans). Carbon dioxide determinations were made after approximately 25 minutes of each ventilation modes. No carbon monoxide (limit of detection = 25 parts per million) or oxides of nitrogen (limit of detection = 5 parts per million) were detected. Carbon dioxide was present in the 300 - 500 parts per million range. Two additional samples for formaldehyde were collected using tubes containing impregnated charcoal as the collection medium. No formaldehyde was detected; limit of detection approximately 0.5 ppm (see Table).

V. EVALUATION AND RESULTS

The absence of measurable amounts of carbon monoxide and oxides of nitrogen indicates that no appreciable exhaust gases were seeping into the passenger compartment. The presence of small amounts of carbon dioxide might be explained by the carbon dioxide exhaled by the industrial hygienist conducting the sampling. The fact that the carbon dioxide concentration did not increase during the two hours of sampling indicates that the ventilation system performed adequately.

The organic chemicals that had been identified are common industrial solvents (xylene and toluene) or are the types of compounds which might be expected to out-gas from plastics or insulation. Xylene, toluene and trimethyl benzene are capable of producing physiologic responses of the type experienced by the employee, but only at much higher concentrations.

No reference could be found as to the concentrations of these materials which might be considered as "normal" for a new automobile. The concentrations of chemicals, as were found, would not be expected to produce the physiologic responses experienced.

At the time of sampling for carbon monoxide, etc., when the automobile was approximately a year old, the requestor of the health hazard evaluation stated that his discomfort when using the automobile has lessened and was pronounced only after the automobile had been in the sun for several hours. It appears likely that the etiologic factors in this case were the chemicals which out-gassed from the plastics in the passenger compartment, and which are gradually being reduced with time.

VI. RECOMMENDATIONS

In order to reduce the discomfort which may result from exposure to out-gassed chemicals, the following recommendations are made:

1. Whenever possible, park the automobile in a shady, cool location.
2. If it is necessary to park the automobile in direct sunlight, windows should be left open, security permitting.
3. On hot days, ventilate the passenger compartment before driving.
4. Use adequate ventilation when driving on hot days - open windows or vent fans in full operation or air conditioning, with fans in full or mid-range operation.

VII. DISTRIBUTION - AVAILABILITY

Copies of this report are currently 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 22161. Information regarding its availability from NTIS can be obtained from NIOSH's Publication Office at the Cincinnati address. Copies of this report have been sent to:

1. Supermarkets General Inc.
2. The requestor of the Health Hazard Evaluation
3. U.S. Department of Labor, OSHA, Region II

4. U.S. Department of Health and Human Services,
NIOSH, Region II

5. N.J. Commissioner of Health

VIII. AUTHORSHIP - ACKNOWLEDGEMENTS

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Concentrations of Possible Contaminants

<u>Substance</u>	<u>Mode of Ventilation</u>	<u>Time of Sample</u> minutes after start of mode of ventilation	<u>Concentration</u> parts per million <u>parts of air (ppm)</u>	<u>Limit of Detection</u>	<u>OSHA</u> <u>Permissible</u> <u>Expos. Limit</u> <u>(ppm)</u>	<u>NIOSH</u> <u>Rec. Standard</u> <u>(ppm)</u>
Carbon Monoxide (date of survey April 17, 1980)	None Low Air Condition Heating	5, 15, 30 5, 15, 30 5, 15, 30 5, 15, 30	ND ND ND ND	25 ppm	50	35
Carbon Dioxide (date of survey April 17, 1980)	None Low Air Condition Heating	25 25 25 25	500 500 300 300	300 ppm	5,000	1,000
Oxides of Nitrogen (date of survey April 17, 1980)	None Low Air Condition Heating	5, 15, 30 5, 15, 30 5, 15, 30 5, 15, 30	ND ND ND ND	0.5 ppm	(NO) 25 (NO ₂) 5	(NO) 25 1*
Formaldehyde (charcoal tubes) (date of survey April 17, 1980)		5 hours	ND	0.5 ppm	3 (5 ceiling- 30 minutes)	1 as ceiling- 30 minutes.
Toluene (date of survey Sept. 28, 1979)	None (engine not in operation)	2-3 hours	0.05 mg/M ³	0.02 mg/M ³	200 (300 ceiling- 10 min.)	100 (200 ceiling- 10 min.)
Formaldehyde (date of survey Sept., 28) 1979) (direct reading tubes)	None (engine not in operation)	20 minutes	ND	1 ppm	3 (5 ceiling- 30 minutes)	1 as ceiling- 30 minutes.

ND = None detected

OSHA and NIOSH limits are for daily exposure for 8 hour (OSHA) or 10 hour (NIOSH) shifts; 40 hour work week.

*NIOSH's recommended limit for NO₂ is a ceiling limit, not to be exceeded.

Note: In addition, traces of xylene, trimethyl benzene, phenyl alkanes (high molecular weight), 2,6 ditertiary butyl para benzoquinone and di-tertiary were detected in samples collected on September 28, 1979.