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 NO. 75-116 -240

CARTER'S INK COMPANY
CAMBRIDGE, MASSACHUSETTS

DECEMBER 1975

I. TOXICITY DETERMINATION

On the basis of environmental data collected during the period of this evaluation, July 2 and September 5, 1975, it may be concluded that a health hazard from exposure to three types of ink, developmental in nature, could not be identified. It was suspected that the printing process may have liberated alpha-Naphthylamine from the inks. However, no levels of alpha-Naphthylamine were detected on any of the environmental samples. Charcoal tube samples also indicated the absence of common aliphatic and aromatic hydrocarbons and filter samples revealed that only low concentrations of total particulates (0.4-2.7 mg/M^3) were present during the printing operations. Bulk ink samples were analyzed for the percent of alpha-Naphthylamine present in each. The two high temperature inks contained 0.2% and 0.1%, by weight of alpha-Naphthylamine. Alpha-Naphthylamine, if present in the low temperature ink was less than 0.01%.

II. DISTRIBUTION AND AVAILABILITY OF DETERMINATION REPORT

Copies of this Determination Report are available upon request from the Hazard Evaluation Services Branch, NIOSH, U.S. Post Office Building, Room 508, 5th and Walnut Streets, Cincinnati, Ohio 45202. Copies have been sent to:

a) Carter's Ink Company, Cambridge, Massachusetts
b) U.S. Department of Labor - Region I
c) NIOSH - Region I

For the purpose of informing the approximately ten "affected employees", the employer shall promptly "post" the Determination Report in a prominent place near where exposed employees work 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. 699 (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 (NIOSH) received such a request from the employer regarding possible exposure of employees to alpha-Naphthylamine.

IV. HEALTH HAZARD EVALUATION

A. Conditions of Use

The health hazard evaluation was conducted in an area where development work is being performed on a high speed electrophoretic printer. A maximum of ten employees come into contact with the operation, with typically one to two people working in close proximity to the printer. The health hazard evaluation was requested because of the possibility of alpha-Naphthylamine being present in the inks used in the process and the possibility of its release into the work area during printing operations. Two processes are involved, one high temperature and one low temperature. The process, equipment and inks are highly confidential and proprietary in nature.

B. Evaluation Methods

On the initial survey conducted July 2, 1975, personal breathing zone and area samples were collected on charcoal tubes in series with filters. Bulk samples of the inks and their individual constituents were also obtained.

Initial work on the samples collected at Carter's Ink dealt with the two main bulk ink samples - the high temperature ink and the low temperature ink. The inks were heated to temperatures matching the operational temperatures of the printers. Charcoal tube samples were collected over these heated samples and analyzed using standard gas chromatographic procedures.

Charcoal tubes were also prepared in the laboratory by injecting various amounts of alpha-Naphthylamine standards onto the charcoal. Recovery from the charcoal was attempted using various solvents but none was found to be effective. Since no suitable desorption solvent could be found, charcoal tubes were not used for alpha-Naphthylamine determinations.

Five bulk samples were analyzed for alpha-Naphthylamine. Weighed amounts of the bulks were dissolved in methanol and analyzed by gas chromatography.

Analysis of the filter samples was performed by mixing the filter with 1 ml methanol. Since the filters were partially dissolved in the alcohol it was necessary to centrifuge all samples prior to analysis. Analysis was conducted using gas chromatographic procedures with the lower limit of detection being 0.006 μg/filter of alpha-Naphthylamine.

On the follow-up survey personal breathing zone samples and area samples were collected using silica gel tubes. The samples collected on the silica gel tubes were analyzed using gas chromatographic procedures. Under the laboratory's operating conditions, a detection limit of 1 microgram alpha-Naphthylamine per tube was established. One personal and two area filter samples were also taken to determine total particulates. The particulates collected were mostly carbon and other inert solids and considered to be nuisance dust.

C. Evaluation Criteria

Alpha-Naphthylamine is considered by some to be a carcinogenic agent. It is suspected of being an etiological factor in the induction of bladder cancer. The contamination of alpha-Naphthylamine by beta-Naphthylamine, a potent carcinogen, and mixed occupational exposures involving alpha-Naphthylamine and other aromatic amines has confounded the epidemiologic conclusion that alpha-Naphthylamine is carcinogenic in man. Epidemiologic studies have, however, failed to eliminate alpha-Naphthylamine as a human bladder carcinogen. Alpha-Naphthylamine is listed in Section 1910.93d of the Federal Register by the Occupational Safety and Health Administration, Department of Labor, as a carcinogenic substance and contains requirements for areas containing this substance and work practices and procedures. These requirements, however do not pertain to solid or liquid substances containing less than 1.0 per cent by weight or volume of alpha-Naphthylamine. In the case of any carcinogen it is very difficult to determine an allowable "working level" standard. Based on theoretical considerations, there is probably no threshold for carcinogenesis, although it is possible that with very low concentrations, the latency period might be extended beyond the life expectancy. In view of these considerations, NIOSH recommends, in the case of carcinogenic agents, the only acceptable levels are levels not detectable by present analytical methods.

D. Evaluation Results and Discussion

Analysis conducted on the bulk samples showed that alpha-Naphthylamine was detected only in the high temperature inks. The high temperature ink had a concentration of 0.1-0.2% by weight of alpha-Naphthylamine. A sample of the high temperature ink collected on the follow-up survey, which had been modified in make-up, contained approximately 0.1% alpha-Naphthylamine. Alpha-naphthylamine if present in the low temperature ink was less than 0.01% by weight.

No significant peaks were detected from the analysis of the charcoal tubes which were collected over the heated samples of ink. These results indicate the absence of common aliphatic and aromatic hydrocarbons.

The concentration of alpha-Naphthylamine on all filter samples collected on the initial survey was less than 0.006 mg/filter, the lower limit of detection (Table 1).

The location and results of the samples taken on the follow-up survey are shown in Table 2. None of the silica gel samples displayed any detectable peak for alpha-Naphthylamine. Several front glass wool

plugs and back-up sections were also analyzed and found to contain no measurable alpha-Naphthylamine. Therefore, the concentration of alpha-Naphthylamine was less than 1 µg/tube for all samples. Therefore, based on the environmental data collected no health hazard from exposure to alpha-Naphthylamine **was detected at the time of this evaluation.**

Measured concentrations for total airborne particulates were all found to be well below existing standards. Table 3 shows that concentrations ranged from 0.47 mg/M^3 to 2.7 mg/M^3 as compared to the standard of 15 mg/M^3.

V. AUTHORSHIP AND ACKNOWLEDGMENTS

Report Prepared By:

Dawn Gilles
Industrial Hygienist
Hazard Evaluation Services Branch
Cincinnati, Ohio

Originating Office:

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

Acknowledgments

Analytical Laboratory Services:

Ardith A. Grote
Chemist
Physical and Chemical Analyses Branch
Cincinnati, Ohio

Environmental Evaluation:

Beth S. B. Levy
Industrial Hygienist
Hazard Evaluation Services Branch
Cincinnati, Ohio

Table 1

Filter Samples For Alpha-Naphthylamine

Carter's Ink Company
Cambridge, Massachusetts

July 2, 1975

Sample Location	Sample Number	Sampling Period	Sample Volume (liters)	Alpha-Naphthylamine
(High Temperature Printer)				
Printer Operator	1	8:23-11:50	207	N.D.*
Area Above Printer	2	8:25-11:50	205	N.D.
Area Left Side of Printer	3	8:26-11:50	204	N.D.
Area Right Side of Printer	4	8:28-11:50	202	N.D.
Area Behind Printer	5	8:32-11:50	396	N.D.
(Low Temperature Printer)				
Area Above Printer	6	9:05-12:04	179	N.D.
Area Beside Printer	7	9:07-12:04	177	N.D.
Area Above Printer	8	9:05-12;04	358	N.D.

* N.D. - Not Detected; limit of detectability = 0.006 mg/filter

Table 2

Silica Gel Samples For Alpha-Naphthylamine

Carter's Ink Company
Cambridge, Massachusetts

September 5, 1975

Sample Location	Sample Number	Sampling Period	Sample Volume (liters)	Alpha-Naphthylamine
		(High Temperature Ink)		
Area Above Printer	1	9:37- 9:48	2.6	N.D.*
Area Above Printer	2	9:51-10:21	1.5	N.D.
Area Beside Printer	3	9:17-10:37	4.1	N.D
Printer Operator (1)	4	9:12-10:37	3.0	N.D.
Area Above Printer	5	9:15-10:37	3.6	N.D.
Printer Operator (2)	6	9:21-10:37	4.6	N.D.
		(Modified High Temperature Ink)		
Area Beside Printer	8	10:50-11:50	2.7	N.D.
Printer Operator (1)	9	10:47-11:50	2.9	N.D.
Area Above Printer	10	10:47-11:50	3.0	N.D.
Area Above Printer	11	10:51-11:01	2.2	N.D.
Area Above Printer	12	11:03-11:33	1.7	N.D.

* N.D. - Not Detected; limit of detectability = 1 μg/tube

Table 3

Filter Samples For Total Particulates

Carter's Ink Company
Cambridge, Massachusetts

September 5, 1975

Sample Location	Sample Number	Sampling Period	Sample Volume (liters)	Total Particulate (mg/M^3)
Printer Operator	364	9:12-11:50	220	0.47
Area Above Printer	379	9:15-11:50	216	2.7
Area Behind Printer	374	9:12-11:50	213	0.82