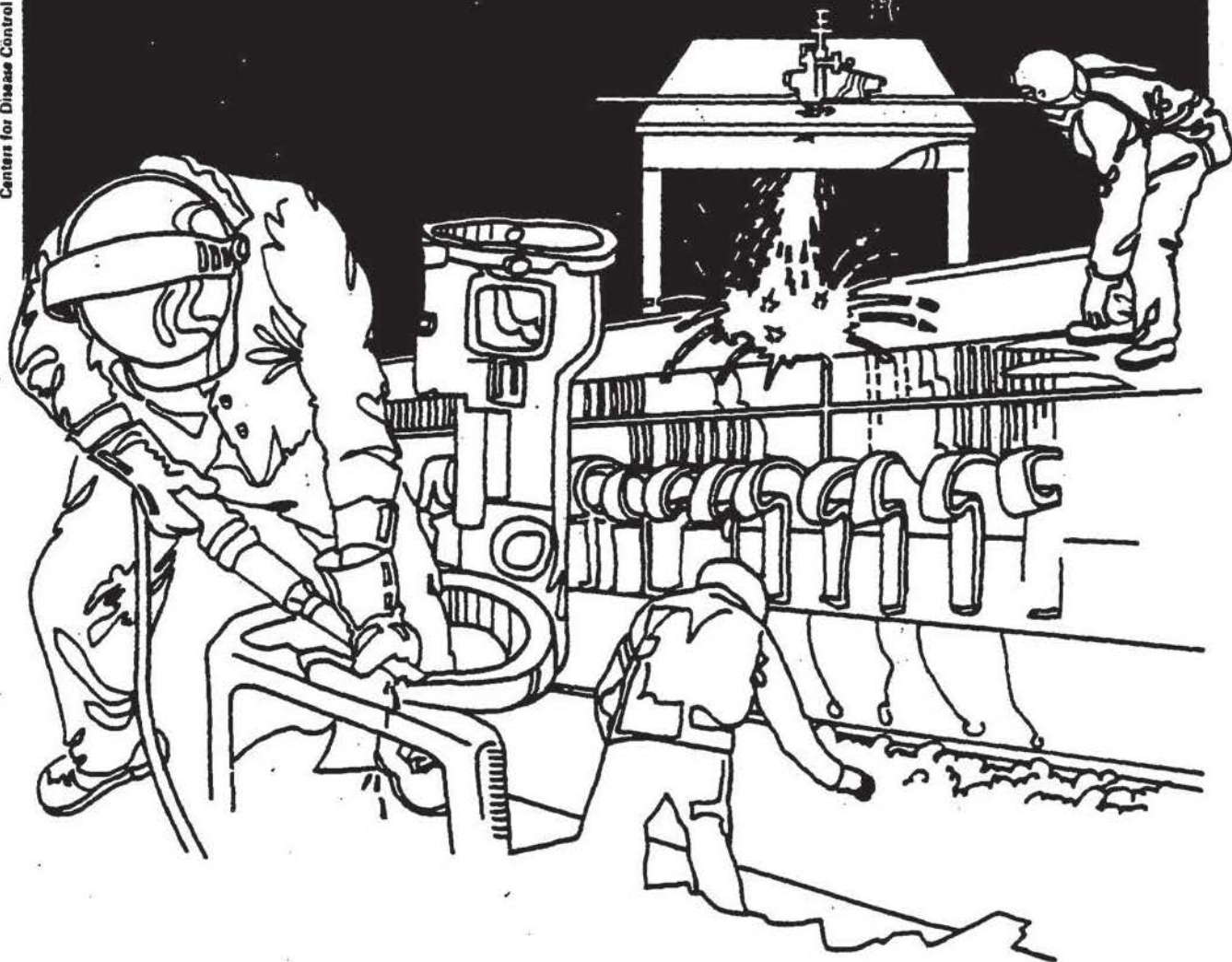


NIOSH



Health Hazard Evaluation Report

HETA 85-100-1585
LENNOX CHINA
POMONA, NEW JERSEY

PREFACE

The Hazard Evaluations and Technical Assistance Branch of NIOSH conducts field investigations of possible health hazards in the workplace. These investigations are conducted under the authority of Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6) which authorizes the Secretary of Health and Human Services, following a written request from 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 Hazard Evaluations and Technical Assistance Branch also provides, upon request, medical, nursing, and industrial hygiene technical and consultative assistance (TA) to Federal, state, and local agencies; labor; industry and other groups or individuals to control occupational health hazards and to prevent related trauma and disease.

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LENNOX CHINA
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I. SUMMARY

In December 1984 the National Institute for Occupational Safety and Health (NIOSH) was requested to evaluate a possible excess of cancer among employees in the decal department at Lennox China, Pomona, New Jersey. The company is a manufacturer of fine china.

Five cancer cases, all fatal, have occurred among the 12 employees of this department since 1979. All the workers in this department are female. These employees are responsible for cutting out decals which are subsequently placed on china. Their work area consists of two large air-conditioned rooms. In one room, 10 women cut out decals by hand with scissors; in the second room, 2 women use perforating machines to cut the decals. Both rooms are used for decal storage.

After an initial visit in December 1984 by a NIOSH industrial hygienist, a physician and an industrial hygienist from the New Jersey Department of Health conducted a site visit on January 28, 1985. The investigators spoke with employer and employee representatives, toured the two work areas of the decal department, and reviewed personnel records of the five employees with cancer. Death certificates were available in the personnel files for four of these five cancer cases. The cancer cases were of five different types: breast, colon, hypernephroma (kidney), mesothelioma (lining of lung or abdominal cavity), and nasopharynx (nose/throat).

Industrial hygiene sampling conducted by the company was reviewed. Family members of the cancer cases were interviewed to obtain more information on previous job history and personal risk factors for development of cancer.

The investigation confirmed that all five women had different types of cancer. The information also indicated that the five cases had no work history in common other than employment in the decal department at Lennox, that there appeared to be no current exposure to known carcinogens in the decal department, and that no previous exposure to carcinogens in the decal department could be identified through interview with both employee and employer representatives who had been at the plant since its opening in 1955.

Most significantly, in light of current knowledge of occupational cancer, the fact that all five cancers were of different types virtually ruled out the possibility that a common workplace exposure in the decal department at Lennox was the causal factor in the development of cancer in these five women.

Based on these observations, we conclude that there was no identifiable health hazard from exposure to cancer-causing agents in the decal department at Lennox Company. Recommendations addressing the health and safety concern of workers in this department are found in Section IX of this report.

Keywords: SIC 3262, cancer

II. INTRODUCTION AND BACKGROUND

In December 1984 NIOSH received a request for a Health Hazard Evaluation (HHE) from an employer representative at Lennox China in Pomona, New Jersey, to investigate a possible excess of cancer in a small work area at its manufacturing facility.

The plant, which employs 1500 people over three shifts and has been in operation since 1955, manufactures fine china. The area of concern was the decal department, where in two work areas a group of 6-12 women cut out decals which are subsequently placed on china. Five cases of cancer, all fatal, had occurred among workers in this department since 1979.

During an initial investigation conducted by the company (to be described below), no known carcinogenic (cancer-causing) workplace exposures were identified. In December 1984 a walk-through investigation was conducted by Nick Fannick, a NIOSH regional industrial hygienist, who likewise could identify no known carcinogenic exposures. The HHE was assigned to the New Jersey Department of Health (NJDOH), under a cooperative agreement with NIOSH, to provide medical input into the investigation.

A physician and an industrial hygienist from the NJDOH visited the plant on January 28, 1985. After initial discussions with the Personnel Administrator and the Director of Industrial Relations, the employment records and death certificates of the cases were reviewed, a walk-through investigation of the two work areas was conducted, and discussions were held with the current workers in the decal department as well as with officers of Local 236A of the Glass, Pottery, Plastics and Allied Workers, which represents plant employees.

III. DESCRIPTION OF WORK AREAS AND WORK PROCESS

The decal department consists of two work areas: the cutting room, approximately 57' x 24', where 8-10 employees sit at tables cutting out decals, and the perforating room, about 25' x 20', where two women operate perforating machines which cut out the decals. Decal storage areas are present in both rooms.

Both rooms are air conditioned and, according to plant personnel, have been air conditioned since their first operation. The present perforating room has been present since the plant opened in 1955, when it served as the cutting room. The current cutting room was constructed in 1964. The original cutting room was then vacant, except for stored material, for approximately seven years until the perforating machines were purchased in 1971 and placed in that work area. Air conditioners were replaced in the perforating room in 1964 and again within the past year because of their age and frequent maintenance requirements; the current cutting room still has its original 1964 air conditioner, although this has recently undergone major repair.

Observation of the area revealed paper dust around work areas, particularly in the perforating room, and solvent-type odors emanating from the decal storage areas. Workers in the two rooms complained of irritation from the paper dust, especially at the perforating machines, and of the "stuffy" atmosphere of the room.

IV. WORKPLACE EXPOSURES

In 1983, when concern first arose over the possibility of a workplace exposure contributing to an apparent cancer excess rate among workers in the decal department, Lennox hired Rossnagel and Associates, a consulting firm based in Medford, New Jersey, to sample for known carcinogens in the two work areas.

The firm submitted two reports, one based on their analysis of samples taken by the company, and another based on their own sampling.

The August 8, 1983 consultant report, based on samples taken by Lennox on an unspecified date, listed the results of tests taken for organic vapors, using organic charcoal badges with gas chromatographic analysis, and "fugitive" dust.

Three full-shift area dust samples, two taken from unspecified locations in the perforating room and one from an unspecified location in the cutting room, yielded total dust results of 0.98 and 2.3 mg/cubic meter (perforating room) and 3.5 mg/cubic meter (cutting room). Although this latter measurement represents a high dust level, all measurements were well below the allowable limit of 10 mg/cubic meter. What is meant by fugitive dust is not specified.

Results of the organic vapor analysis, which tested for various solvents, showed levels below the limits of detection for all 50 solvents measured. Two full-shift measurements were taken, one in an unspecified area of the cutting room and another in an unspecified area of the perforating room.

Three additional dust samples taken from various surfaces in the two rooms were not analyzed for dust. The reason for this is not clear from the report.

The consultants performed their own sampling on September 30, 1983. Sampling times were not indicated for the organic vapor samples; other sampling times ranged from 1.5-2.5 hours.

Two dust samples, one in each of the two rooms, yielded results below 1 mg/cubic meter. Organic vapor measurements were again taken in both rooms (two samples in each) and results were all below the limit of detection except for monochlorobenzene, which in the decal room measured 1.9 mg/cubic meter and 1.2 mg/cubic meter. The Occupational Safety and Health Administration (OSHA) permissible exposure limit (PEL) for this substance is 350 mg/cubic meter time-weighted average (TWA). One asbestos sample was taken in each of the two

rooms; no asbestos was found. Cotton dust results were higher in the perforating room (0.36 and 0.47 mg/cubic meter) than in the decal room (0 and .26 mg/cubic meter); all results were below the current PEL of 1 mg/cubic meter. Two formaldehyde measurements, one from each room, each yielded results of approximately .02 mg/cubic meter; the current OSHA PEL is 2.5 mg/cubic meter TWA.

The September 30 investigation included measurements of air pressure and circulation in the two work areas. The consultants concluded that both rooms had the desired positive static pressure as compared to the main factory area, but that the ventilation system was inadequate and that more air changes with a greater percentage of fresh air. According to Lennox management, the makeup air supply to the cutting room currently includes 30% fresh air.

In addition, the consultants observed that both workrooms were dirty and that there was mold, bacteria and dust contamination of humidifiers.

It should be noted that, among the sampling results reported by the consultants, only asbestos and benzene (an organic solvent) are known human carcinogens. Formaldehyde has produced cancer in laboratory animals; thus NIOSH recommends that it be considered a potential occupational carcinogen. The chemical contents of the paper dust present in both rooms could not be fully evaluated on the basis of currently available information.

Based on a review of the 1983 sampling data, observation of the work areas, and discussions with workers and management on January 15, 1985, we concluded that no further sampling of these two work areas was needed for the current investigation.

We did note, however, that in the silk screen area, located a short distance from the decal rooms, there was a prominent solvent odor and those working in the area complained of its irritative effect. There was little effective local ventilation in this work area. No recent sampling data for this area was available.

Other than the two 1983 consultant's reports reviewed above, no historic sampling data was available for the two work areas included in the current investigation. According to employees and management, there had been no change either in work process or ventilation, other than that described above, since the two operations were initiated. Employees noted that over the years there have been changes in layout within the room, primarily due to an increase in the number of stored decals. While there has been asbestos removal in other areas of the plant, no visible asbestos has been noted in the two work rooms. Thus there is no evidence at present that past workplace exposures were different from current ones, although possible past exposures have not been and probably cannot be adequately identified.

V. DESCRIPTION OF WORKFORCE IN DECAL DEPARTMENT

Over the thirty years of the plant's operation, from 6-12 employees, all women, have worked in the decal department at any one time. According to plant personnel, there is very little employee turnover in this department, although no records were available to document exactly how many women had worked in the department since the plant began operation.

VI. DESCRIPTION OF CANCER CASES

A description of the cancer cases known to have occurred among workers in the decal department from 1979 through 1984 is contained in the following chart. The data was abstracted from company personnel records, which included death certificates for four of the deceased employees. It should be noted that cancer cases among PREVIOUS decal department workers who have left the plant cannot be identified from the personnel records.

Case No.	Type of Cancer	Year of Birth	Years at Lennox	Years in Decal Department
1	Breast	1918	23	16
2	Nasopharyngeal (nose-throat)	1924	15	14
3	Hypernephroma (kidney)	1921	16	15
4	Mesothelioma (lining of lung or abdominal cavity)	1921	28	28
5	Colon	1926	14	13

According to fellow workers, case 5 had also had a skin cancer in the past.

Review of personnel records indicated that all of these women except case 4 had worked briefly in other areas of the plant, including jigger make, jigger finish, gold lining, burnishing, etch, and bisk select (see Appendix I for diagram of plant). However, there was no one department or area that all five had in common other than the decal department.

According to personnel records, cases 3 and 5 had worked in the perforating room as well as the cutting room; the other three women were listed as working solely in the cutting room.

Interviews with family members of all five cases yielded no definitive evidence of potentially carcinogenic exposures in previous jobs or in the home environment.

Case 4, whose type of cancer (mesothelioma) is almost always associated with a history of asbestos exposure, had been employed sewing army uniforms. An occupational physician for the U.S. Army reported that, according to Army uniform developers in Natick, Massachusetts, only laboratory gloves contained asbestos during World War II and the Korean War years. Details about Case 4's job duties during this previous employment are not available. Her spouse reports no asbestos exposure in the home and denies any occupational asbestos exposure to himself or any family member with whom case 4 had lived. No asbestos has been present in the raw material at the Pomona Lennox plant; as noted previously, asbestos pipe insulation has been removed from some areas of the plant but, according to plant personnel, the decal department never contained such insulation. According to plant records, Case 4 worked solely in the decal department.

VII. EVALUATION CRITERIA

Because cancer is not a single disease and each type of cancer has many possible associated factors, investigation of suspected "epidemics" of cancer can be very difficult.

For each type and site of cancer, family history, ethnic background, previous history of cancer, age, sex, lifestyle habits such as smoking, and environmental or occupational exposures may be factors, either individually or in combination, in the development of the disease. With regard to carcinogenic environmental or occupational exposures, it should be noted that the cancer becomes clinically evident after a very long latency period, that is, as many as 20 to 40 years after the exposure takes place.

The classic picture of cancer related to workplace exposures is that the cancer incidence or mortality (death rate) pattern in a group of similarly exposed workers indicates a clear excess in a SPECIFIC TYPE of cancer (1). This excess remains even when the other possible causative factors are taken into consideration.

Some occupational cancers that have been identified by investigating such "epidemics" of a specific type of cancer in groups of exposed workers include lung cancer in asbestos and chromium workers, leukemia in workers exposed to benzene, and bladder cancer in workers exposed to the chemical beta-naphthylamine. The cause-effect relationships between exposure and cancer were discovered by first noting the unusual occurrence of a type of cancer, and then investigating what exposure the affected workers had in common. Once a cancer-causing agent has been identified, surveillance programs are established in the workplace to try to identify the specific cancer in other exposed individuals so that an early diagnosis can be made. An early diagnosis can benefit not only the affected individual, but also fellow workers who then have a clue that excessive exposures are taking place and action may be initiated to limit such exposures.

VIII. RESULTS, DISCUSSION AND CONCLUSION

On the basis of current knowledge regarding occupationally-related cancers, we conclude that the cancer "epidemic" among decal department employees at Lennox is NOT a result of workplace exposure in that department. There is no single chemical or physical agent currently identified as causing this particular group of cancers. Furthermore, the fact that all cancers are of a different cell type and in different anatomic sites makes it highly unlikely that a currently unrecognized carcinogenic workplace exposure might be a common causal factor. Further investigation into this hypothetical possibility is therefore not warranted.

Why these particular women developed their particular cancers cannot be answered with certainty. Cancer is a multifactorial disease, and each type of cancer is associated with many "risk factors", that is, individual characteristics that increase the likelihood of developing that type of cancer.

Breast cancer, a very common cancer in women, has many risk factors, including family history of breast cancer, reproductive history, nutritional status, history of radiation exposure, and pre-existing breast disease (2). Family members of Case 1 report none of these risk factors.

Nasopharyngeal cancer may be related to cigarette smoking (2), exposure to wood dust (2), and, possibly, formaldehyde (3). The widower of Case 2 denies the presence of any of these exposures.

Hypernephroma has also been associated with cigarette smoking and occupational exposures to coke oven emissions and, possibly, asbestos (2). None of these were reported by family members of Case 3.

Most cases of mesothelioma are believed to result from asbestos exposure (2). As noted above, no history of asbestos exposure has yet been definitively identified in Case 4.

Colon cancer incidence has been associated with various dietary and hereditary factors and history of other bowel diseases (2). Family members of Case 5 report no family or personal history of bowel disease.

The absence of known risk factors in these five cases is not uncommon among cancer victims, since these factors have been identified only in studies of large populations and are often absent or unidentified in individual cases. In addition, despite recent increases in understanding of and knowledge about cancer, much remains to be learned and many risk factors remain to be identified.

The fact that these five cancer cases do not appear related to previous exposures in the decal room at Lennox should serve to allay fears of increased cancer risk from previous employment in the decal room. The apparent absence of known carcinogens in the current workplace atmosphere should further reassure present workers that future occupational cancers from exposures in this department at Lennox are extremely unlikely.

IX. RECOMMENDATIONS

In the course of the investigation, NIOSH investigators made several observations which, while not directly related to the question of carcinogenic agents in the workplace, do merit some comment.

1. Workers in the decal room complained about the stuffy atmosphere of their work areas, and the consultants' report documented ventilation rates less than those generally recommended. Adoption of their recommendations should serve to correct this problem.

2. Initial company measurements of dust levels (August 8 report) yielded results that, while below the current allowable limit, might be associated with some discomfort among the workers. Further evaluation is recommended.

3. Decal room workers, understandably concerned over the cancer cases among their co-workers, have inquired about the appropriateness of a "screening" exam for cancer.

As noted above, cancer is not a single disease, and thus there is no comprehensive physical exam to screen for all types of cancer. Since there appears to be no specific cancer associated with workplace exposures in the decal room and since current workplace exposures reveal no exposure to known carcinogens, no special screening is warranted on the basis of workplace exposures.

The American Cancer Society and other medical organizations do recommend periodic examinations for the general population, the content and frequency of which depend on age, sex, personal medical history, and other non-occupational factors. Such exams might include screening for cervical, breast, or bowel cancer. It is recommended that employees consult their personal physicians to make sure they are receiving appropriate medical care in this context.

4. We recommend that an educational program on cancer and, in particular, occupational cancer, be conducted for decal department employees. Copies of all reports related to this investigation should be given to these employees and discussed at this educational program.

5. Inspection of the silk screen room and review of previous exposure measurements taken in the area suggest a possible health hazard from solvent exposure in that area. NIOSH recommends that Lennox investigate this problem further.

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XII. DISTRIBUTION AND AVAILABILITY OF REPORT

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.

Copies of this report have been sent to:

1. Lenox China, Pomona, New Jersey
2. Local 236A, Glass, Potter, Plastics and Allied Workers
3. NIOSH Region II
4. U.S. Department of Labor, OSHA, Region II

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