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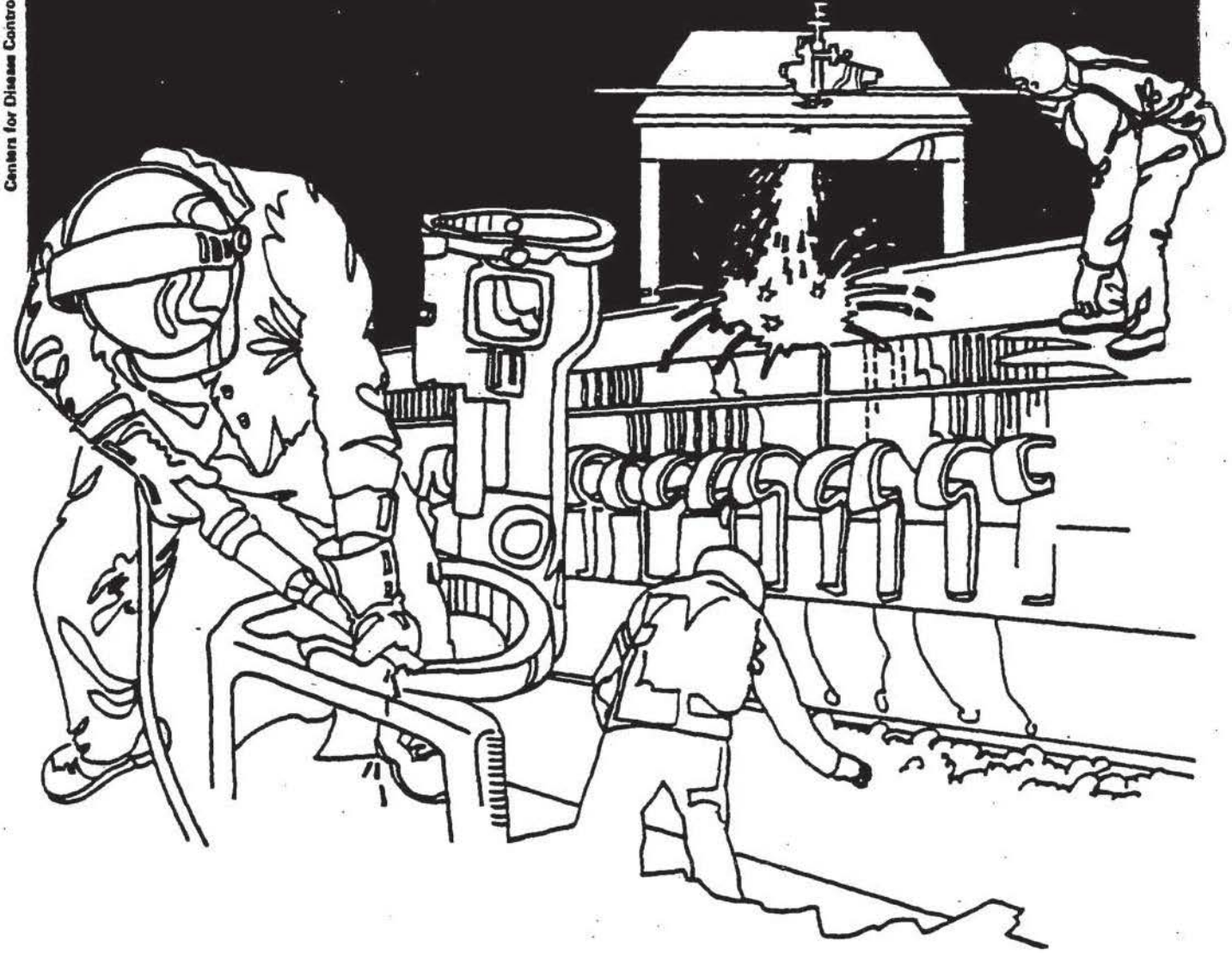

Health Hazard Evaluation Report

HETA 84-270-1494
FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D.C.

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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I. SUMMARY

On April 5, 1984, the National Institute for Occupational Safety and Health (NIOSH) received a request to evaluate cases of Hodgkin's disease and leukemia among workers at the offices of the Federal Energy Regulatory Commission (FERC) in Washington, D.C. On April 11, NIOSH investigators conducted a walk-through investigation of the building and its environs. Personnel records for the period 1979-1984 were used to identify other possible cases of Hodgkin's disease and leukemia. Additionally, case-finding was performed by interviewing supervisors, workers, and union representatives.

To determine if the cancers are in excess of what would be expected, standardized incidence ratios (SIRs) were calculated for Hodgkin's disease and leukemia. The SIRs for Hodgkin's disease and leukemia were 490 ($p = 0.062$) and 467 ($p = 0.062$), respectively. This does not represent a statistically significant excess incidence for the five-year period.

A radiation survey of selected areas of the building was conducted; no radiation levels exceeded usual background levels.

Based on the environmental and epidemiological findings we have determined that there was no statistically significant excess of cases of leukemia and Hodgkin's disease among employees of the Federal Energy Regulatory Commission. No environmental agents have been identified or detected that can be associated with the cases that were identified. It is very likely that there are no building-related common causes and that the cases represent a chance clustering.

KEYWORDS: SIC 9631 (Government), cancer cluster, Hodgkin's disease, leukemia

II. INTRODUCTION

On April 5, 1984, NIOSH received a request from the Federal Energy Regulatory Commission (FERC) to investigate whether cases of leukemia or Hodgkin's disease among employees at its offices at 825 N. Capitol Street, Washington, D.C., were related to environmental factors. An epidemiologist and an industrial hygienist made a visit to the site on April 11, 1984. A progress report was sent to the FERC Director of Facilities and Operations Support on April 25, 1984.

III. BACKGROUND

The FERC has occupied its present nine-story cast concrete office building since 1973. Three cases of cancer (two leukemia and one Hodgkin's disease) in workers who were in their late 20's or early 30's, and who worked in the Market Branch of the Office of Pipeline and Producer Regulation, prompted the concern that led to this investigation. All three of these workers had offices on the seventh floor and had worked from three to five years in the building. Except for some ground level stores, the building is completely occupied by the FERC. There are no laboratories or other major sources of chemicals in the building, except for a printing plant in the basement. The printing plant had been evaluated by an industrial hygiene consultant in January 1984 because some employees had dermatitis or nose bleeds. The consultant's report identified three solvents used in the printing plant (#44 Kleen, #106 Safety Wash, and #9 Rubber Rejuvenator,) but did not give the precise formulations. Material Safety Data Sheets indicated that two of the solvents were chlorinated hydrocarbons with Threshold Limit Values (TLVs) of approximately 300 ppm, and one aliphatic hydrocarbon with no TLV assigned. Air samples taken by the consultant around various printing machinery showed concentrations of xylene, toluene, hexane, and methylene chloride all to be within current OSHA standards. Carbon monoxide levels were also found to be within the OSHA standard. The consultant was of the opinion that the basic problem of the print shop was inadequate ventilation. The shop is ventilated directly outside and not into the general building ventilation system. No sources of benzene (a known leukemogen) were mentioned in the report.

IV. EVALUATION DESIGN AND METHODS

A. Environmental Evaluation

A walk-through evaluation of the building was conducted on April 11, 1984. The evaluation included the seventh floor, the print shop, parking garage, and area adjacent to the building. The offices of each of the initial cases were inspected. Information

was gathered on the age and composition of the building, its ventilation system, cleaning materials used, prior tenants, and previous transitional uses or activities that might have occurred. Workers were interviewed about any strange odors.

On June 1, 1984, a radiation survey of selected areas of the FERC Building was conducted. The survey was done in response to employee concern about possible radiation exposure. The objective of the survey was to determine if high levels of ionizing radiation, which is known to be carcinogenic, were present in this building and possibly were responsible for the excess cases of leukemia or Hodgkin's disease. A Ludlum model 12 count ratemeter coupled with a Ludlum model 43-5 probe was used to survey surfaces for alpha radiation. This instrument was calibrated prior to the survey with a 2-nCi Thorium-230 source ($T_{1/2}$ = $8x10^4$ years). The efficiency was determined to be 6.26%. A Thorium-230 check source was used prior to and after the survey to confirm proper operation. A Ludlum model 3 survey meter coupled to a Ludlum model 44-6 side-window Geiger-Mueller tube probe was used to detect beta/gamma radiation. This instrument was calibrated and checked with an 8-uCi Cesium-137 source ($T_{1/2}$ = 9 hours) at a distance of three inches. Certain areas outside the building and within the building were selected as "control" areas, and the radiation levels in these areas were compared to the radiation levels in the seventh floor offices being investigated. Both instruments were set on their most sensitive setting. Walls, desk tops, chairs, floors, lamps, and other objects within each area were surveyed with each instrument.

B. Epidemiological Evaluation

1) Case-finding

The three cases that prompted the investigation were confirmed by interview. Efforts were made to identify other cases of leukemia or Hodgkin's disease in the building. The Personnel Department was asked to provide information from their records. Representatives of Local 421 of the American Federation of Government Employees were also interviewed about other possible cases. All three living cases were interviewed.

2) Evaluation of cancer incidence

The incidence of leukemia and Hodgkin's disease were evaluated by determining the Standardized Incidence Ratio (SIR) for the observed and expected cases. The expected numbers of each type of cancer were determined by applying (to the population at

risk) age-specific U.S. incidence rates for the period 1973-77. These were derived from the Surveillance, Epidemiology and End Results (SEER) program of the National Cancer Institute (1). The rates for leukemia were for all types combined. The incidence period 1979-1984 was evaluated, since that represented the period in which the three initial cases were diagnosed. Hence the number of annual expected cases was multiplied by five to give the expected incidence for the five year period.

V. EVALUATION CRITERIA

A. Environmental

The National Council on Radiation Protection (NCRP) recommended exposure limit for ionizing radiation for nonoccupationally exposed persons is 500 millirem/year. A mR (milliroentgen), a unit of exposure for x-rays and gamma rays, is considered equivalent to a milliRem (roentgen-equivalent-man), which is a method of expressing dose. (Technically, the unit of dose is a rad; multiplying this by a factor representing relative biological effectiveness yields the unit dose equivalent, or rem. For gamma rays, x-rays, and beta particles, 1 rem = 1 rad; for alpha particles, 1 rem = 10 rads.)

B. Epidemiological

In order to determine if there is an excess number of cancers in the population at risk, the observed cases are compared with the expected cases by a measure known as the Standardized Incidence Ratio. If the ratio is greater than 100, and statistically significant (i.e., p less than 0.05), an excess risk of cancer is presumed to exist. Even if a statistical excess risk is found though, it must be interpreted in terms of consistency with other studies and biological plausibility before it can be stated that the disease is biologically related to the setting in which it is found.

VI. RESULTS AND DISCUSSION

A. Environmental Evaluation

As a result of this investigation no known leukemogenic chemicals were found anywhere in the building, including the print plant, the building's largest source of chemicals. The ventilation of the print plant was directly to the outside and did not utilize the same ventilation system as the rest of the building. We also

considered whether the location of the ventilation ducts of the building was such that they could capture exhaust from the print shop. The supply air openings are on the east side of the building at the first floor level, and the print shop exhaust opening is on the south side at approximately the first floor level. Given these locations, we would not expect reentrainment of the possibly chemical-laden exhaust air into the building ventilation system. The air currents necessary for this to happen would have a dissipative effect on any chemical substances in the exhaust air.

None of the cleaning materials used in the building were believed to contain benzene, nor was there a differential use of cleaning materials on the seventh floor.

Reports by office workers on the seventh floor of strange diesel exhaust-like odors were found to be attributable to waste collection trucks that idled near the building's air intake vents. (No association between diesel exhaust and leukemia or Hodgkin's disease is known.)

The findings of the radiation survey are shown in Table 1. Alpha radiation levels were less than 20 $\pm$ 4 counts per minute (CPM) in all areas surveyed. When corrected for counting efficiency, which converts cpm to dpm (disintegrations per minute), the alpha radiation levels are less than 320 $\pm$ 15 dpm. Further calculations to convert these data to an exposure rate or dose rate for alpha radiation would require many assumptions, but such an exercise is unnecessary since alpha activity levels in the area of concern (seventh floor offices) are not higher than those in the control areas. Beta/gamma radiation exposure ranged from 0.01 to 0.08 mR/hr in the control areas and 0.01 to 0.03 mR/hr in the areas of concern. Gamma only radiation was identical to beta/gamma levels in all areas, indicating that the levels measured were due solely to gamma radiation. The likely source of this radiation is a combination of terrestial and extraterrestial (cosmic rays) sources usually referred to as natural background. The beta/gamma radiation levels in the areas of concern are no higher than those in the control areas. Taking the highest level recorded inside the building--0.03 mR/hr--and assuming a 40 hour/week exposure for a year, the resulting yearly exposure is 62 mRem, which is 12% of the National Council on Radiation Protection recommended exposure limit of 500 milli Rem/year for occupationally unexposed persons.

B) Epidemiological Evaluation

The original three cases were confirmed to be two cases of leukemia and one case of Hodgkin's disease. Two other reported cases of

Hodgkin's disease were evaluated. One was a nonmalignant condition and the other was confirmed as Hodgkin's disease. No other cases were found or suspected.

Table 2 shows the age distribution and number of cases of leukemia and Hodgkin's disease found during the five-year period. The age distribution is for the current workforce. The SIRs of 467 ($p = 0.062$) for leukemia and 490 ($p = 0.062$) for Hodgkin's disease were not statistically significant.

VII. CONCLUSIONS

No occupational or environmental risk factors were found in this study that can be associated with leukemia or Hodgkin's disease. Generally, these are not known to be occupationally-induced cancers, except for leukemia due to benzene or radiation exposure. There has been some speculation that solvent exposure might be associated with Hodgkin's disease (2, 3).

The role of viral agents in these two disease is speculative. Unequivocal evidence for either an endogenous or horizontally (person-to-person) transmitted leukemia virus is lacking. RNA tumor virus components have been found in fresh or cultured leukemic tissue, but whether this has any significance for leukemogenesis is not known (4). No specific cause of Hodgkin's disease has been identified, although a transmissible agent has been postulated (5).

The number of cases found in this study was not significantly different from the number that would be expected. It is quite likely that the cases are unrelated to any physical environmental factor present in the building. Clusters of these two diseases, with no attributable causes, have been reported in the literature (3, 5). It is believed that such clusters are often chance occurrences.

VIII. RECOMMENDATIONS

After consideration of the above, there are no environmental or medical surveillance recommendations that can be made.

IX. REFERENCES

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IX. AUTHORSHIP AND ACKNOWLEDGEMENTS

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X. DISTRIBUTION AND AVAILABILITY OF REPORT

Copies of this report are currently available upon request from NIOSH, Division of Standards Development and Technology Transfer, Publications Dissemination Section, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days, the report will be available through the National Technical Information Service (NTIS), 5285 Port Royal, Springfield, Virginia 22161. Information regarding its availability through NTIS can be obtained from NIOSH Publications Office at the Cincinnati address. Copies of this report have been sent to:

1. William G. McDonald, FERC
2. Gordon Giersch, FERC
3. NIOSH, Region III
4. OSHA, Region III

For the purpose of informing affected employees, copies of this report shall be posted by the employer in a prominent place accessible to the employees for a period of 30 calendar days.

Table 1

Radiation Survey of FERC Building
Washington, D.C.

June 1, 1984

Control Locations	Radiation Levels			
	Alpha Count (cpm)	Alpha Activity (dpm)	Gamma (mR/hr)	Beta-Gamma (mR/hr)
Investigator's Office Cincinnati, Ohio	<20 ± 4	<320 ± 15	0.06-0.08	0.06-0.08
Room 316 Skyline Inn Washington, D.C.	<20 ± 4	<320 ± 15	0.05	0.05-0.06
Outside FERC Building Washington, D.C.	<20 ± 4	<320 ± 15	0.04-0.05	0.04-0.05
Facilities Manager's Office FERC Building	<20 ± 4	<320 ± 15	0.01-0.03	0.01-0.03
Stairway, FERC Building	<20 ± 4	<320 ± 15	0.01-0.02	0.01-0.02
Room 8502, Library FERC Building	<20 ± 4	<320 ± 15	0.01-0.02	0.01-0.02
Room 3305B FERC Building	<20 ± 4	<320 ± 15	0.01-0.02	0.01-0.02
Affected Areas in FERC Building				
Room 7300B	<20 ± 4	<320 ± 15	0.01-0.02	0.01-0.02
Room 7300A	<20 ± 4	<320 ± 15	0.01-0.02	0.01-0.02
Room 7300C	<20 ± 4	<320 ± 15	0.01-0.03	0.01-0.03
Room 7312J	<20 ± 4	<320 ± 15	0.01-0.02	0.01-0.02
Room 7410	<20 ± 4	<320 ± 15	0.01	0.01
Room 7402	<20 ± 4	<320 ± 15	0.01	0.01
Room 7215	<20 ± 4	<320 ± 15	0.01-0.02	0.01-0.02
Room 7307	<20 ± 4	<320 ± 15	0.01-0.02	0.01-0.02
Printing Plant	<20 ± 4	<320 ± 15	0.01-0.02	0.01-0.02

Table 2

Age distribution of cases of leukemia and Hodgkin's Diseases employed at the FERC building

Age	Number	Expected Leukemia	Observed Leukemia	Expected Hodgkin's Disease	Observed Hodgkin's Disease
15-19	5	0.00341	0	0.00025	0
20-24	55	0.00495	0	0.00334	0
25-29	209	0.02508	1	0.02400	1
30-34	374	0.04675	1	0.05049	1
35-39	355	0.06358	0	0.06390	0
40-44	210	0.04410	0	0.06405	0
45-49	142	0.04402	0	0.06319	0
50-54	138	0.06348	0	0.09385	0
55-59	86	0.06149	0	0.01608	0
60-64	58	0.01339	0	0.01583	0
65+	39	0.05791	0	0.01357	0
Total	1216	0.42817	2	0.4085	2
SIR		$\frac{2}{0.42817} \times 100 = 467$		$\frac{2}{0.4085} \times 100 = 490$	
		$p = 0.062$		$p = 0.062$	