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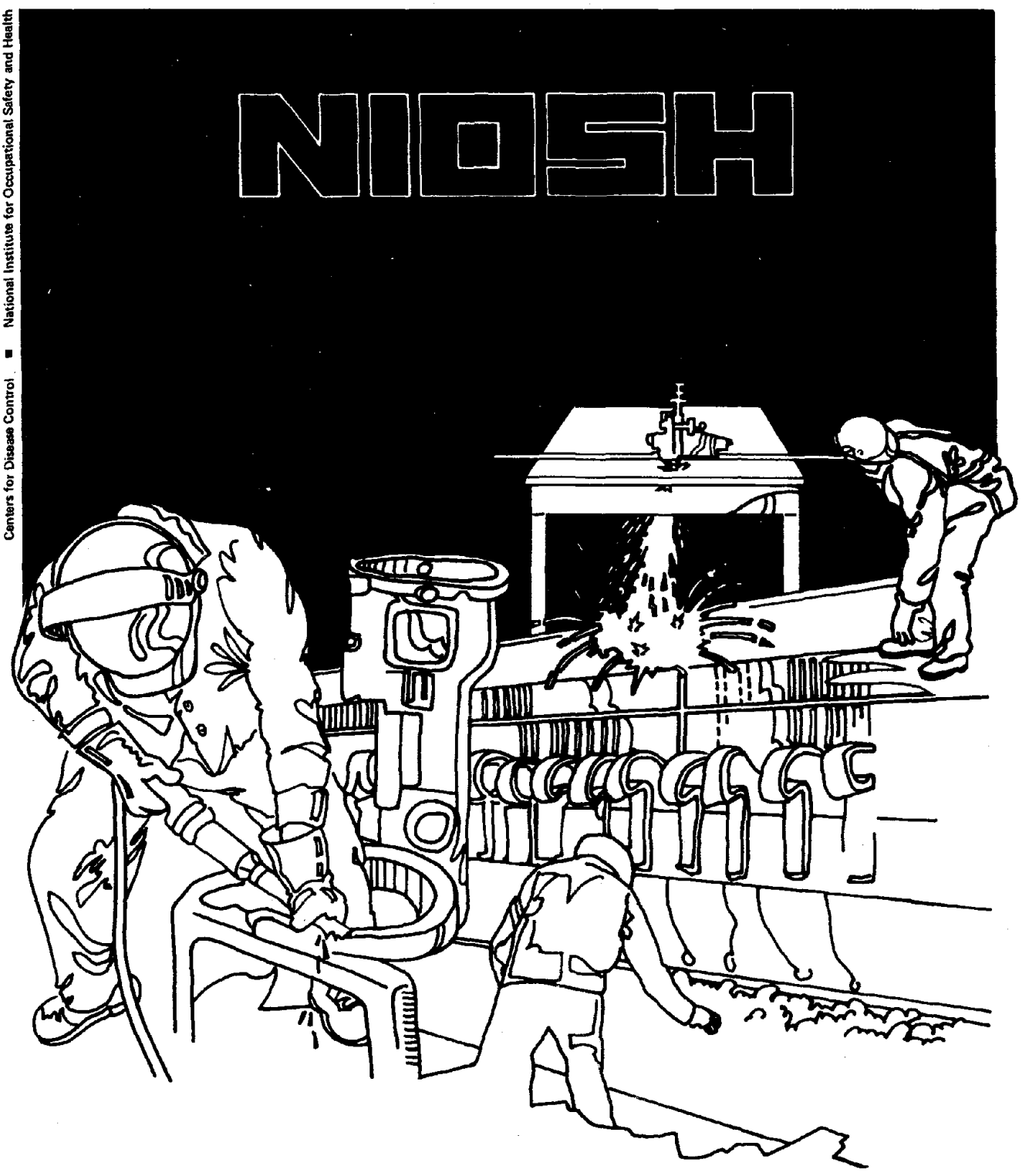

Health Hazard Evaluation Report

HETA 81-274-1328
ALUMINUM COMPANY OF AMERICA
NEWBURGH, INDIANA

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.

HETA 81-274-1328
JUNE 1983
ALUMINUM COMPANY OF AMERICA
NEWBURGH, INDIANA

NIOSH INVESTIGATORS:
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I. SUMMARY

In April of 1981, the National Institute for Occupational Safety and Health (NIOSH) received a request to conduct a Health Hazard Evaluation (HETA) at the Aluminum Company of America's (Alcoa) Warrick Operations located in Newburgh, Indiana. Specifically, a request was made for an evaluation of excess worker exposures to coal tar pitch volatiles in the anode block fabrication and kiln areas (Buildings 260 and 254) and an evaluation of worker mortality due to leukemia and diseases of the blood-forming organs associated with these exposures. NIOSH had previously conducted a health hazard evaluation (HETA 75-91-489) in 1975 at this facility which included exposure to coal tar pitch volatiles and the possibility of excess cause-specific mortality. The Occupational Safety and Health Administration (OSHA) was in the process of evaluating worker exposure to coal tar pitch volatiles in this same area at the time of the request.

After reviewing the earlier Hazard Evaluation Report and holding discussions with the requestors and with OSHA, a decision was made to limit the current investigation to updating the mortality study originally conducted in 1975. The 1975 study indicated that of 49 deaths, a disproportionate number were due to cancer of the digestive system and leukemia, as well as deaths due to suicide and homicide. The current study, like its predecessor, examines the proportionate mortality of 101 deaths identified from records obtained from the company's insurance program. These deaths covered the period 1960 (plant start-up) to 1981. Cause of death was determined by a qualified nosologist using the revision of the International Classification of Diseases (ICD) in effect at the time of death. Age-, race-, sex-, and calendar-specific death rates, derived from U.S. white male deaths, were applied to determine the expected numbers of deaths by cause.

Proportionate mortality ratios (PMR) were computed for most major causes of death by comparing observed to expected deaths. Three causes of death had a statistically significant excess number of deaths. These were: cancer of the rectum, PMR = 459 (2 observed, 0.44 expected); all cancers of the liver, PMR = 8.27 (2 observed, 0.24 expected); and neoplasms of lymphatic and hematopoietic tissue other than lymphosarcoma, Hodgkin's disease, and leukemia, PMR = 388 (2 observed, 0.52 expected). To further evaluate the meaning of these findings, proportionate cancer mortality ratios (PCMR) were computed. Only cancer of the liver remained statistically in excess, PCMR = 679 (2 observed, 0.29 expected) suggesting that the elevated PMRs seen for cancer of the rectum and cancer of the lymphatic system were likely artifactual and caused by the data set).

Deaths in the ICD categories 200-209 (malignant neoplasms of lymphatic and hematopoietic tissues) showed greater than expected numbers of deaths (10 observed, 6.09 expected), but this finding was not statistically significant.

The finding of two cases of liver cancer, when only 0.29 was expected, is statistically significant, but not particularly remarkable because the variability resulting from small numbers. No other significant excesses of specific site (including leukemia and other malignant neoplasms of lymphatic and hematopoietic tissue) was found.

The reader is referred to the original study report (HETA 75-91-489) for recommendations concerning corrective measures to reduce coal tar pitch volatile exposures, environmental monitoring, personal protective equipment, personal hygiene, worker education, and medical and epidemiologic surveillance of the workers.

KEYWORDS: SIC 3353 (Aluminum Sheet, Plate, and Foil), anode production, coal tar pitch volatiles, proportionate mortality study, cancer, leukemia, liver cancer.

II. INTRODUCTION

In April 1981, the National Institute for Occupational Safety and Health (NIOSH) received a confidential request to conduct a Health Hazard Evaluation (HETA) at the Aluminum Company of America's (Alcoa) Warrick Operations in Newburgh, Indiana. The requestors had two concerns. The first was to assess exposures to coal tar pitch volatiles in Buildings 260 and 254 (the anode block fabrication and kiln areas). The second concern was whether an excess incidence of deaths due to leukemia or diseases of the hematopoietic system was occurring among workers at the plant.

III. BACKGROUND

A. Previous NIOSH Activity

NIOSH conducted a health hazard evaluation at Alcoa's Warrick Operations during the mid 70's (1975-1977) in response to a request from Local 104 of the Aluminum Workers International. This request concerned possible health hazards associated with exposures to oil mists in the rolling mills and oil houses. Subsequently, an additional request was filed to evaluate production and maintenance personnel exposures to "kiln gases" (coal tar pitch volatiles) and carbon monoxide in the anode block fabrication and kiln areas (Buildings 260 and 254). This second request also was concerned with two reported cases of leukemia occurring among maintenance men exposed to kiln gases. The Health Hazard Determination Report (No. 75-91-489) was issued in May of 1978 and a clarification was added in November of 1978.[1] Copies of this report have been made available to interested parties associated with the health hazard evaluation which is the subject of this current report (HETA 81-274).

B. Chronology of Events

April 1981 - NIOSH receives confidential request to evaluate coal tar pitch volatiles exposure in Buildings 260 and 254 of Alcoa's Warrick Operation in Newburgh, Indiana, and to look at mortality associated with diseases of the hematopoietic system.

May 1981 - NIOSH project officer determines that the Federal Occupational Safety and Health Administration (OSHA) is in the process of evaluating worker exposures to coal tar pitch volatiles and respirable dust in Buildings 260 and 254 with sampling conducted March 19, 20, and 23, 1981.

June 1981 - NIOSH investigators decide that the portion of the request concerning exposures to coal tar pitch volatiles has been satisfactorily addressed in the previous HETA and is currently under investigation by OSHA. OSHA conducted inspections of

Buildings 260 and 254 on March 19, 20, 23, and June 6, 1981, which included sampling for coal tar pitch volatiles. NIOSH, therefore, decided to limit its evaluation to a follow-up of the recommendation made in Determination Report 75-91-489 which was to repeat the mortality evaluation of workers at Alcoa in 5 years (indicated as 1980).

July 1981 - Alcoa is contacted regarding the HETA request and asked to provide death certificates for workers who had died since the conclusion of the previous mortality study in September 1975.

August 1981 - OSHA citation and notification of penalty issued to Alcoa for overexposure of worker in Buildings 254 and 260 to CTPVs (exceeding 0.2 mg/m^3), failure to provide appropriate respiratory protection, and for failure to determine and implement feasible administrative/engineering controls to reduce employee exposure(s).

September 1981 - Preliminary analyses of recent death certificates (September 1975 to July 1981) is begun and efforts to locate death certificates from the original study initiated. NIOSH is also informed by OSHA that a citation has been issued for overexposures to coal tar pitch volatiles and that the citation is being contested.

January 1982 - Alcoa is requested to provide an additional set of the 49 death certificates used in the original study covering the period 1960 to 1975.

February 1983 - Proportionate mortality study and proportionate cancer mortality study for the period covering 1960-1981 at the Alcoa Warrick Operations is completed.

April 1983 - Proportionate mortality and cancer mortality study results incorporated into a final report. OSHA citation still being contested by Alcoa, with no indication of the case's conclusion or impact on original conditions given at the time of NIOSH's report preparation.

June 1983 - Alcoa case contesting citations for overexposure to coal tar pitch volatiles and absence of adequate respiratory protection to protect exposed workers still pending before the Occupational Safety and Health Review Commission (OSHRC). OSHA's response and future actions cannot be determined until a ruling has been made by the OSHRC.

C. Mortality Study Background

This worker population was originally studied by NIOSH in 1975. A mortality study of 49 deaths indicated that there were slight excesses of deaths due to cancer of the digestive system and

leukemia, as well as deaths due to suicide and homicide. The current study was performed in part because of the recommendations in the earlier study to repeat it in about 5 years.

IV. MORTALITY STUDY METHODS

In order to determine if there is an excess of deaths due to any causes and specifically, leukemia and cancers of the digestive system, a proportionate mortality study was performed. This type of study involves a comparison of the observed and expected deaths due to various cause-specific diseases in the plant population. The expected number of deaths is calculated from the proportions of age, sex, and calendar time period U.S. white male mortality experience.

A total of 101 deaths were identified from records obtained from the company's insurance program. These deaths occurred in the period 1964-1981. It is not known if other deaths occurred among employees who were not vested in the life insurance programs.

All causes of death were determined from death certificates by a qualified nosologist who coded according to the revision of the International Classification of Diseases (ICD) in place at the time of death. Age-, race-, sex-, and calendar time-specific proportional rates were determined from the U.S. white male population and then applied to the ascertained deaths to determine the expected number of deaths.

V. RESULTS

Proportionate mortality ratios (PMRs) were computed for most major causes of death categories. Three causes were identified with PMRs that were statistically significantly elevated. They were: cancer of the rectum, PMR = 459 (2 observed, 0.44 expected); all cancers of the liver, PMR = 827 (2 observed, 0.24 expected); and cancer of other lymphatic tissue, PMR = 388 (2 observed, 0.52 expected). Because PMRs are concerned with proportions of disease, and often are inclined to artifactually indicate excesses where none exist, proportionate cancer mortality ratios (PCMR) were computed. By confining the analysis to only proportion of cancer, there is less opportunity for artifactual results. When this was done, only cancer of the liver was in excess, in terms of a significant confidence interval, PCMR = 679 (2 observed, 0.29 expected).

Since the previous study had indicated that there was an excess of leukemia, special attention was given to this cause of death. All deaths in the ICD categories 200-209 (leukemia and other neoplasms of lymphatic and hematopoietic tissues) were grouped and the PCMR for that category was computed to be 164 (10 observed, 6.09 expected). This finding was not statistically significant.

VI. DISCUSSION

Of the two cases of liver cancer found to be in excess in the study, one was not actually a primary liver cancer (hepatocarcinoma), rather it was cancer of the gall bladder. This does not support the theory of a common cause. Further, the two cases observed compared with the 0.29 expected represent components of a ratio which is subject to extreme variation due to the small number in the numerator. In addition, since this finding was not hypothesized prior to the study, it may be the result of chance due to simultaneous inferences (multiple comparisons). Put simply, if you make a large number of comparisons, such as done in a PMR study, by chance alone some findings will be "positive".

The previous NIOSH industrial hygiene study did not find any hepatic carcinogen exposures. However, coal tar products which were identified, have been reported to cause a variety of cancers including those of the lung and skin, and possibly colon, pancreas, buccal cavity, and pharynx.[2]

Milham[3] evaluated mortality in a study of aluminum reduction plant workers and found that some of the lymphatic and hematopoietic cancers (especially malignant lymphoma), lung cancers, and pulmonary emphysema may be of occupational origin in that group. Although the current NIOSH study involves anode production rather than aluminum reduction, many of the potential exposures (such as to coal tar pitch volatiles) are similar. Hence, while this study did not support the findings in the Milham study, it does not preclude them either.

One of the limitations of the mortality study is that the only deaths evaluated were those gathered through the company's insurance carrier. If these deaths were not representative of all the deaths, studies that looked at proportions of cause-specific deaths can be severely biased.

At this time, there is not sufficient evidence to conclude that an occupational cancer excess exists at this plant, since the general pattern of deaths due to malignant causes does not appear to be significantly different than what is expected. This does not, however, rule out the possibility of such risk, given the potential for exposure to the identified carcinogens present. The plant has only been in operation since 1960, and consequently the opportunity for an exposed workforce to exhibit any significant excess of cancer is unlikely due to the fact that most cancers caused by chemical exposures will not develop until many years after exposure.

VII. RECOMMENDATIONS

The recommendations given in the previous HE report (75-91-489)[1] addressing the reduction of employee exposure to coal tar pitch volatiles (CTPV) by the use of engineering controls, monitoring workers

for exposures to CTPVs, initiating adequate respiratory protection and personal protective equipment programs in instances where exposures cannot be controlled by engineering modifications, assuring good personal hygiene, employee education, and continued medical surveillance are still appropriate. The company and union officials should monitor deaths identified through the insurance program with particular attention to cancers of the liver, lymphatic and hematopoietic tissues, and the respiratory system.

VIII. REFERENCES

1. Salisbury SA, Philbin EJ. Health hazard evaluation - Alcoa Aluminum Company: Report No. 75-91-489. Cincinnati, Ohio: National Institute for Occupational Safety and Health, 1978.

2. National Institute for Occupational Safety and Health. Criteria for a recommended standard: occupational exposure to coal tar products. Cincinnati, Ohio: National Institute for Occupational Safety and Health, 1978. (DHEW publication no. (NIOSH) 78-107).

3. Milham S. Mortality in aluminum reduction plant workers. J. Occupational Med. 21:475-80, 1979.

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, 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. Requestors of HETA 81-274
2. Local 104 of the International Aluminum Workers Union
3. Aluminum Company of America, Warrick Operations, Newburgh, Indiana
4. NIOSH, Region V
5. OSHA, Region V

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.