U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES ■ Public Health Service
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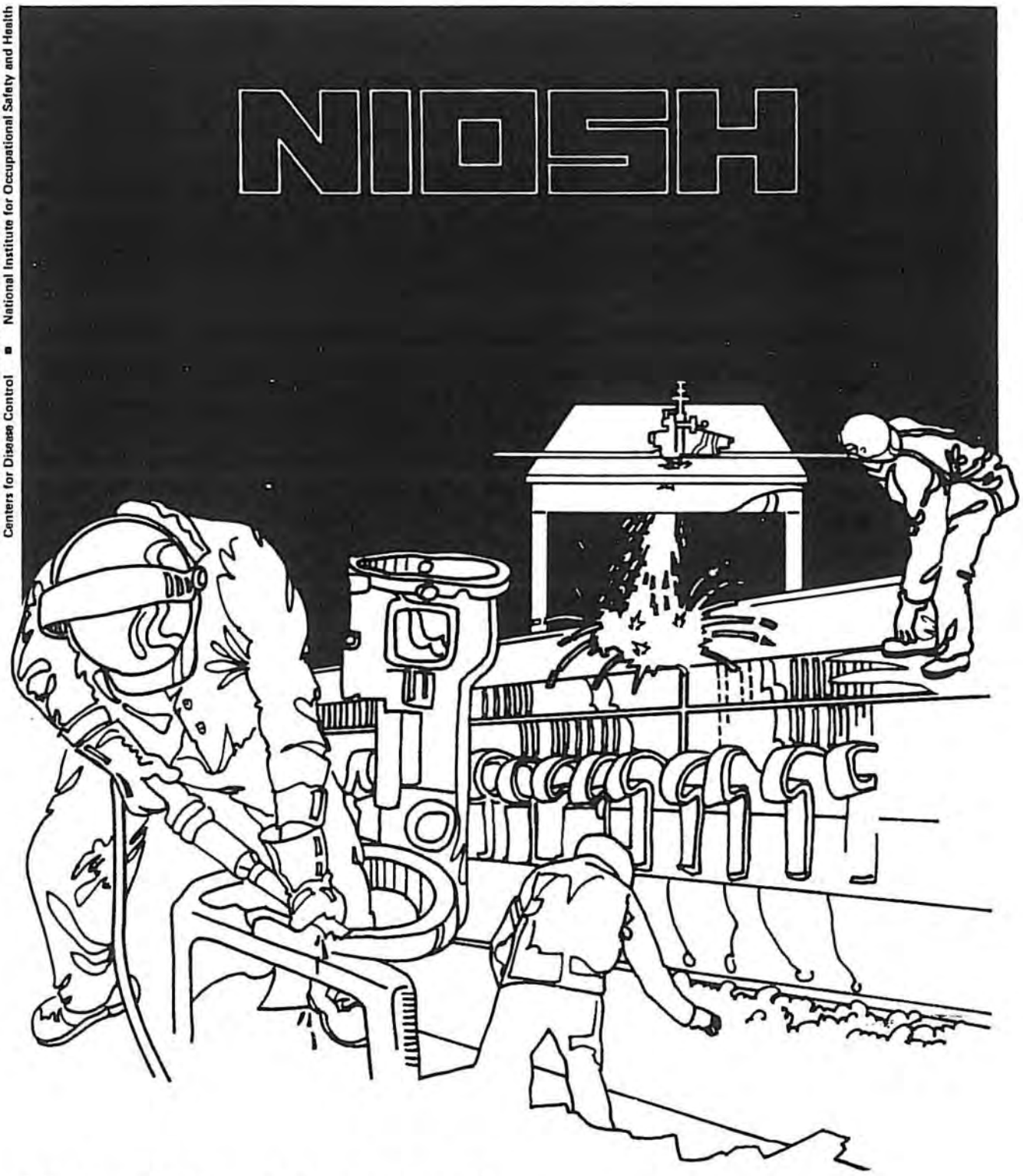

Health Hazard Evaluation Report

HETA 82-368-1308
APPALACHIAN LABORATORY FOR
OCCUPATIONAL SAFETY AND HEALTH
MORGANTOWN, WEST VIRGINIA

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 nygiene 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.

Mention of company names or products does not constitute endorsement by the National Institute for Occupational Safety and Health.

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APPALACHIAN LABORATORY FOR
OCCUPATIONAL SAFETY AND HEALTH (ALOSH)
MORGANTOWN, WEST VIRGINIA

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I. SUMMARY

Between June and December 1982, the National Institute for Occupational Safety and Health evaluated formaldehyde exposures among histology technicians using a surgical biopsy hood in Room 281A of the Appalachian Laboratory for Occupational Safety and Health (ALOSH). A larger study of laboratory personnel working with formaldehyde was conducted as the result of a meeting of several different groups at ALOSH held on April 23, 1982. Personal breathing zone air samples taken June 4, 1982 indicated exposures in excess of the 1976 NIOSH recommended standard of 1 part per million as a ceiling concentration determined during a 30-minute sampling period. The 1976 standard was based on the irritant properties of formaldehyde. In July, modifications were made to the hood. Ventilation measurements and testing with smoke tubes on August 6 indicated that the modified hood should effectively control exposures. On August 20, 1982, the American Federation of Government Employees, Local 3430, requested that the evaluation of formaldehyde exposure at that specific hood be conducted as a formal Health Hazard Evaluation. Personal breathing zone air samples taken on December 8 and 10 failed to detect any formaldehyde exposures. Thus, the hood and procedures used were judged to be in compliance with NIOSH Current Intelligence Bulletin 34 Formaldehyde: Evidence of Carcinogenicity issued April 15, 1981, which states that because of demonstrated carcinogenic potential formaldehyde exposures should be reduced to the lowest feasible limit.

Air sampling results indicate that prior to its modification in July of 1982, histology technicians using the surgical biopsy hood in Room 281A of the Appalachian Laboratory for Occupational Safety and Health to perform the procedures demonstrated on June 4 were exposed to levels of formaldehyde in excess of the NIOSH recommended standard. Ventilation measurements and air samples taken after the modification indicate that the modified hood effectively controls exposures to levels consistent with current NIOSH guidelines.

KEYWORDS: SIC 9431 (Administration of Public Health Programs), formaldehyde, pathology.

II. INTRODUCTION AND BACKGROUND

In August 1982, the National Institute for Occupational Safety and Health (NIOSH) received a formal request from the American Federation of Government Employees (AFGE) Local 3430, to evaluate formaldehyde exposures among histology technicians using the surgical biopsy hood in Room 281A of the Appalachian Laboratory for Occupational Safety and Health (ALOSH) in Morgantown, West Virginia. Such an evaluation was already in progress as part of a larger study of formaldehyde exposures among laboratory personnel in Room 281A and elsewhere in ALOSH. The larger study was decided upon in a meeting held on April 23, 1982 attended by several sectors of the ALOSH community.

Smoke tube testing on April 21, 1982 had indicated the hood was functioning as designed with good capture patterns at the periphery. Thus, the adequacy of the device as a general purpose hood was not in question; however, it was not known whether the hood would provide adequate protection for a substance having an exposure limit as low as 1 ppm or less particularly when the procedure involving such a substance also required close visual examination and delicate surgical manipulation. Formaldehyde was used in the hood during "grossing in" procedures in which tissues and organs are removed from laboratory animals for processing and study. The removal of specific organs and tissues from animals as small as mice and rats can be a tedious, physically demanding task. During this study, 4 to 6 animals were processed in about a two-hour period. Typically, the technician devotes two hours a day to this task until all the animals used in a given study are processed. This breaks up the tedium and frees the technician to work on other necessary daily tasks.

Exposure measurements made in June provided the basis for interim modifications made to the hood in July to improve its effectiveness until a new hood could be installed in the future as part of an on-going rennovation plan to keep pace with changing program plans. Ventilation readings taken in August and exposure measurements made in December verified the effectiveness of the interim modifications.

III. METHODS

Chemical detector tubes, and an infrared spectrophotometer were used on June 4 to determine exposures in the hood prior to modification. After modification, a hotwire anemometer and smoke tubes were used to test the quantity and quality of ventilation provided by the hood. Detector tubes were used to monitor procedures on December 8 and 10, 1982.

IV. EVALUATION CRITERIA

The Occupational Safety and Health Administration (OSHA) permissible exposure limit for formaldehyde is 3 ppm Time-Weighted Average (TWA) with the condition that the exposure may not exceed 5 ppm for any 30 minute period. At no time may exposures exceed 10 ppm. (29 CFR 1910.1000, Table Z-2 as of July 1, 1981)

Prior to 1981 the NIOSH recommended standard for formaldehyde was 1 ppm (1.2 milligrams per cubic meter of air) not to be exceeded during any 30 minute sampling period. This standard was based on the irritant properties of formaldehyde. However, on April 15, 1981, NIOSH issued Current Intelligence Bulletin 34, Formaldehyde: Evidence of Carcinogenicity which recommends that, "formaldehyde be handled as a potential occupational carcinogen" based on studies in which laboratory rats exposed to formaldehyde vapor developed nasal cancer. Based on these studies and demonstrated mutagenic capabilities, NIOSH recommends the reduction of occupational exposures to "the lowest feasible limit."

Acute exposure to formaldehyde can cause a variety of symptoms. From 0.1 to 5 ppm formaldehyde causes a burning sensation in the eyes, tearing, and general irritation of the upper respiratory passages. Exposures on the order of 10 to 20 ppm are associated with coughing, tightness in the chest, a feeling of pressure in the head, and palpitation of the heart. At 100 ppm and above, formaldehyde becomes immediately dangerous to life or health (IDLH) capable of causing pulmonary edema, pneumonitis or death.

V. RESULTS

A. Before Modification

Results of sampling conducted the morning of June 4 indicated that the histology technician was exposed to increasing concentrations of formaldehyde as time went on. The technician worked from 6:00 to 7:00 a.m., took a 15 minute break, and worked from 7:15 to 8:15 a.m. From 6:00 to 7:00 a.m. her average exposure was in excess of 3 ppm (approximately 3.6 ppm) with peaks of approximately 8 ppm. From 7:15 to 8:15 her exposure averaged just under 5 ppm (approximately 4.9 ppm) with a peak exposure of approximately 11 ppm.

The afternoon of June 4 from 1:15 to 1:40 p.m., a pathologist used the hood to prepare tissues from a human lung. His average exposure during this time was a little under 7 ppm (approximately 6.7 ppm) with peak exposures of 10 to 11 ppm.

B. After Modification

Ventilation readings taken August 9, 1982, confirmed that in all three sash positions the modified hood provided more than 100 linear feet per minute of airflow at the face of the hood. Smoke tube testing revealed the hood to be very effective in capturing contaminants inside the hood, at the face of the hood, and in the vicinity just outside the hood.

Exposure measurements were taken using detector tubes on December 8 and 10. At no time was a detectable concentration of formaldehyde measured in the breathing zone of any technician. The detector tubes were sensitive to concentrations down to 0.5 ppm.

VI. CONCLUSIONS

Prior to its modification in July of 1982, histology technicians and others who used the surgical biopsy hood in Room 281A, using the procedures demonstrated on June 4, were exposed to concentrations of formaldehyde in excess of the NIOSH recommended standard. Since its modification, the hood has been shown to effectively control exposures to formaldehyde to less than 0.5 ppm. While the NIOSH recommended standard was clearly exceeded, the 8-hour TWA exposures were well below the OSHA limit. Whether three peak exposures in excess of 10 ppm exceeded the OSHA standard cannot be unequivocally concluded as the accuracy of the measurement was considered to be within ± 30%, i.e., 7.7 to 14.3 ppm.

VII. RECOMMENDATIONS

The procedures used for handling formaldehyde within the surgical biopsy hood as demonstrated on December 8 and 10 should be continued.

VIII. AUTHORSHIP AND ACKNOWLEDGEMENTS

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IX. 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 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. Requestor, AFGE Local 3430
2. Director, DRDS NIOSH
3. NIOSH Regional Office III

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