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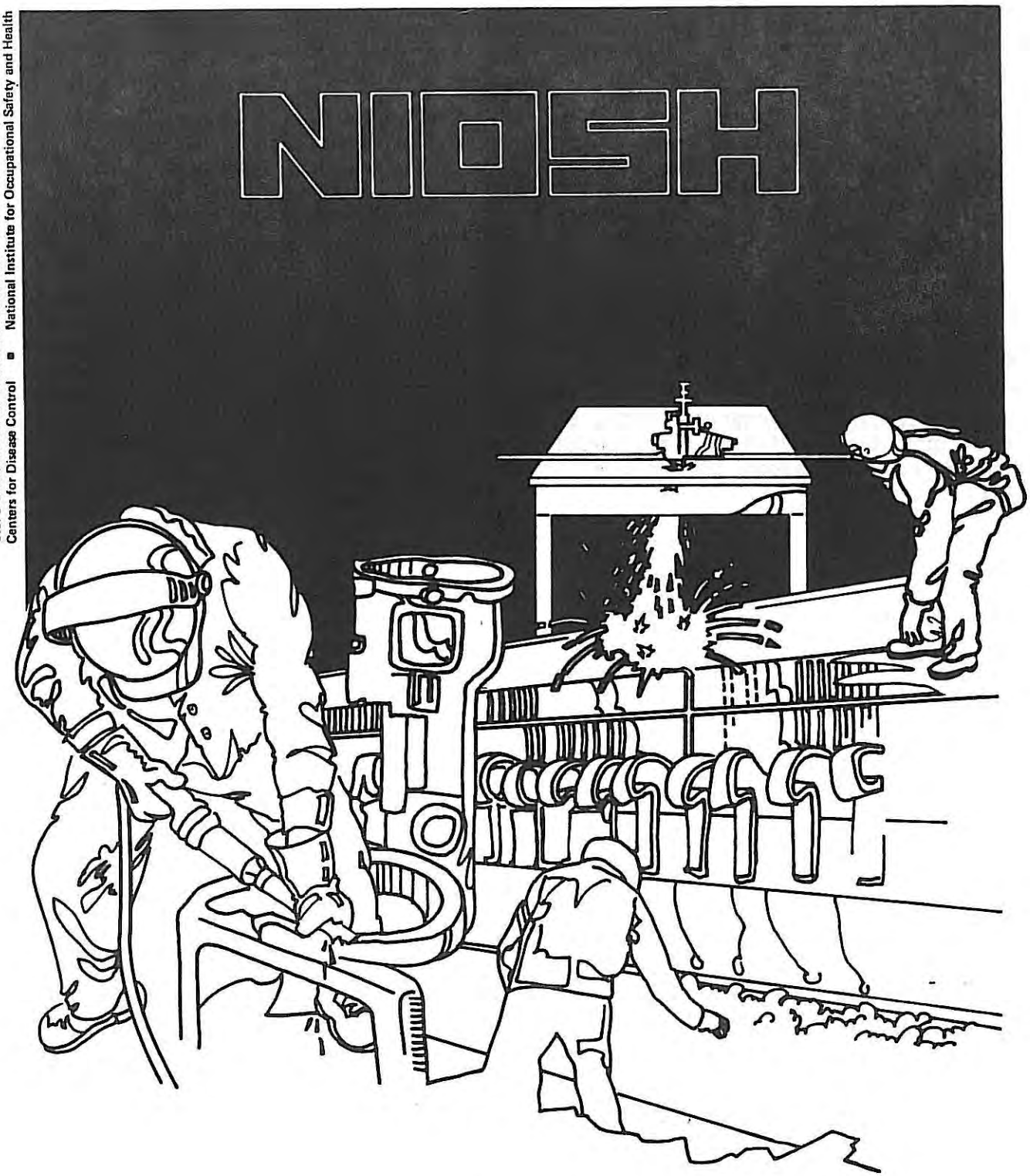

Health Hazard Evaluation Report

HHE 80-183-991
NAVAL BIOSCIENCES LABORATORY
OAKLAND, CALIFORNIA

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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HHE 80-183-991
NOVEMBER 1981
NAVAL BIOSCIENCES LABORATORY
OAKLAND, CALIFORNIA

NIOSH INVESTIGATORS:
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I. SUMMARY

On June 28, 1980, NIOSH received a confidential request for a health hazard evaluation at the Naval Biosciences Laboratory in Oakland, California. The laboratory performs research in the area of human pathogens (including Coccidioides immitis) and the request stated that employees at the laboratory were exposed to biological hazards and that cases of disease had occurred as a consequence of that exposure. NIOSH conducted an initial survey at the facility on September 23-24, 1980, and a follow-up medical investigation on January 18, 1981.

A questionnaire designed to obtain information regarding training and work practices was administered to 12 current and former employees. Representatives of management and employees were interviewed regarding work practices and the policies for medical screening and surveillance were reviewed.

During the initial survey, the handling procedures and biology of Coccidioides immitis, the security practices employed at the facility, and the administrative relationship between the Navy and the University of California were discussed. The P-3 (Biosafety Level 3) laboratories were toured and evaluated. The physical layout, cleanliness, hoods, and other specialized equipment were found to be in accordance with the Centers for Disease Control guidelines[1], and thus appropriate for the handling of hazardous infectious organisms.

The responses to the questionnaire regarding training and work practices revealed that some of the guards currently and formerly employed at the laboratory had received little, and most likely insufficient, training concerning laboratory safety procedures and also that they had been expected to perform tasks for which they had no training or experience. The performance of such tasks, in combination with deficient training, may have put them at risk of exposure to infectious organisms. It was also determined that medical surveillance had formerly not included all personnel categories and that surveillance had not been performed at regular intervals.

During 1980 the laboratory safety manual was extensively revised and improved, and, according to information from management, new procedures for medical surveillance and training have been implemented.

Based on data obtained during this study it appears that certain personnel categories had not received sufficient training regarding laboratory safety procedures and that policies for medical surveillance and hiring practices may have been unsatisfactory in the past. According to information from the laboratory management these deficiencies have now been corrected.

Recommendations pertaining to this evaluation have been included in Section VII of this report.

KEY WORDS: SIC 8071, Coccidioides immitis, coccidioidomycosis, surveillance,

II. INTRODUCTION

On June 28, 1980, NIOSH received a confidential request for a health hazard evaluation at the Naval Biosciences Laboratory in Oakland California. The request reported that employees at the laboratory, where research in the area of human pathogens is performed, were exposed to biological hazards and that cases of disease had occurred as a consequence of that exposure. NIOSH conducted an initial survey at the facility on September 23-24, 1980, and a follow-up medical investigation on January 18, 1981.

An Interim Report pertaining to this evaluation was issued in October 1980.

III. BACKGROUND

The Naval Biosciences Laboratory (NBL) is situated in the Naval Supply Center, Oakland California. NBL performs research and developmental work mainly in the field of human pathogens. Various microorganisms have been studied at the laboratory, the currently most important being the causal organisms of the diseases histoplasmosis, plague, and coccidioidomycosis. The laboratory work is performed in a P-3 facility, implying strict containment of the infectious forms of the various pathogens. Biosafety Level 3 laboratories (P-3) are suitable for experiments involving agents of high potential risk to personnel and to the environment. Although NBL is administratively part of the Navy, the great majority of the laboratory workers are employees of the University of California at Berkeley. There are approximately 100 persons involved in research and developmental work and of these about 12 routinely are present in the P-3 facility, the so-called "Hot Lab".

In September 1979, a black male employee at NBL was diagnosed as having disseminated coccidioidomycosis, a fungal disease caused by inhalation of spores of the species Coccidioides immitis. The employee was a night-watchman and had not been engaged in laboratory work with the infectious form of the organism. However, his duties had required that he often enter areas where such work was performed and where the organism, providing the containment measures were deficient, may have been present in its infectious form.

Concerned NBL employees submitted a confidential request, asking that NIOSH investigate NBL to determine wether or not exposure to biological hazards was currently taking place. The request stated that such exposure had taken place in the past, causing disease among the employees and also that employees in certain job categories had not received adequeate training and information on how to protect themselves when entering the "Hot Lab". According to the request the environmental monitoring of the "Hot Lab" and the medical monitoring of the employees had not been performed in a scientifically satisfactory manner.

IV. EVALUATION DESIGN AND METHODS

In September 1980, a NIOSH industrial hygienist and a medical epidemiologist visited NBL, conducted a walk-through survey of pertinent areas and interviewed representatives of the laboratory staff and employees. The attending physician of the ill employee was also interviewed as were representatives of the Alameda County Health Department.

A walk-through survey of the P-3 laboratory facilities was performed to evaluate physical layout, cleanliness, work flow patterns, and functionality of specialized hoods and equipment. Observations of work practices were not possible during the survey since the operation of the laboratory was interrupted during the walk-through.

During interviews with management and employee representatives information was obtained concerning medical surveillance and hiring policies. The surveillance records were reviewed, as well as the laboratory safety manuals and other available reports regarding laboratory safety procedures and investigations.

Selected employees were interviewed, using a specially designed questionnaire, regarding the training and information they had received while employed at NBL and also regarding current and former work practices. A total of 12 employees were interviewed, three of these persons were currently or had formerly been guards at the facility.

The methods and results of the environmental sampling performed in the P-3 laboratory and adjacent areas were evaluated for comprehensiveness and adequacy in determining the integrity of the laboratory containment features.

V. EVALUATION CRITERIA

The CDC Proposed Biosafety Guidelines for Microbiological & Biomedical Laboratories[1] and the National Institutes of Health Laboratory Safety Monograph[2] were used to evaluate the laboratory practices, physical layout, and biosafety equipment of the facility.

Laboratory personnel in P-3 facilities must have specific training in handling pathogenic and potentially lethal agents and must be supervised by competent scientists who are experienced in working with such agents and who also control access to the laboratory. The facility must have special engineering and design features in addition to physical containment equipment and devices. All procedures involving the manipulation of infectious materials should be conducted within biological safety cabinets or other physical containment devices or by personnel wearing appropriate personal protective clothing and devices.

VI. EVALUATION RESULTS AND DISCUSSION

Although the work practices of employees at NBL were not directly observed, the NBL bio-safety officer gave assurances that microbiological practices and procedures appropriate for safe handling of hazardous infectious organisms were being employed at NBL. All biological safety cabinets in the P-3 laboratories were inspected and had been recently performance tested and certified. The results of the certification testing were on file at the facility. The autoclaves and sterilizers were monitored for performance and documentation of performance was maintained.

The buildings and laboratories are old, yet serviceable, and the facilities have been carefully planned and engineered for the safe containment of hazardous organisms. The ventilation systems employs high rates of air exchange coupled with up to four levels of negative pressure gradients to assure maximum containment.

All surfaces and equipment in P-3 areas are color coded to denote identification of areas or items potentially contaminated. There is a scheduled program of disinfection along with monthly physical inspections of the facilities.

However, in spite of the excellence of engineering design, the degree of safety of a laboratory is also very dependent upon employing safe and appropriate work-practices. The degree of safety inherent in these practices and procedures is directly dependent upon the training and supervision received by the employees. Of the 12 persons that were interviewed concerning training and work practices, 3 guards reported that they had received inadequate training considering the type of work they were required to perform.

The training they had received had only been for a few hours and had not covered the subjects of safety procedures and work practices to be observed in the "Hot lab", and they considered that their lack of training put them at risk of exposure to infectious organisms. They also reported receiving little or no information regarding the specific pathogens or diseases to which they may potentially have been exposed. One of these respondents stated that he on occasion hade been ordered to move laboratory animals, a task for which he had no training and which was not considered to be part of his normal duties.

The remainder of the respondents, 9 persons mainly employed as laboratory technicians, reported having received adequate training and information and did not consider themselves to be at increased risk of developing disease due to exposure in the laboratory.

The medical surveillance policies at the laboratory consisted of repeated serological skin tests for the detection of seroconversion as an indicator of having aquired infection with C. immitis. The tests were usually performed prior to employment and then at intervals of 1-4 years. According to information obtained during interviews with representatives of management and from records of results of the skin tests, the interval between tests appears to have been variable, all personnel categories with potential exposure were not routinely included, and standardized procedures for dealing with persons with seroconversion had not been developed. In addition there were no standardized procedures for investigation cases of disease possibly caused by laboratory infection; as a consequence, several months passed before the case of coccidioidomycosis among the employees resulted in a comprehensive investigation and safety inspection at the laboratory. Such an investigation should obviously have been conducted immediately.

The hiring policies at the laboratory appear to have been inconsistent. Due to increased risk of developing disease, certain racial groups were, prior to 1978, excluded from work in the "Hot lab". This policy, however, did not apply to guards, who routinely were required to enter the "Hot lab".

In certain areas of California the high prevalence of seropositivity to C. immitis indicates a ubiquitous spread of the organism. However, in Alameda County, where NBL is located, coccidioidomycosis is rare, only a few cases per year, which indicates that the organism is not common in that area. It is thus possible that infectious organisms may have been present in the laboratory environment in higher concentrations than in the surrounding area, although this is obviously impossible to determine in retrospect. Consequently, it is reasonable to conclude that, mainly due to lack of training and information, persons working as guards at the NBL may have been at increased risk of exposure to infectious organisms when entering the laboratory, as compared to risk of exposure outside the laboratory, and that past deficiencies in the medical surveillance system could have led to increased probability of developing disease following this exposure.

The magnitude of the potentially increased risk is difficult to estimate since some of the information received has been conflicting, and it is also impossible to determine whether or not the case of coccidioidomycosis that occurred among the employees was caused by exposure to the laboratory environment.

The environmental monitoring in the laboratories was performed by sampling various suspect and non-suspect areas in the facility. Samples were obtained by swabbing several one-foot square areas with sterile cotton-tipped swabs soaked in sterile saline.

The swabs were then inoculated onto trypticase soy agar, for the propagation of a wide variety of organisms, and a Mycosel agar for the isolation of pathogenic fungi. In the sampling reports studied by NIOSH, no pathogenic organisms had been detected using the above method. The cotton-swab method is currently the standard method for qualitative environmental sampling and/or recovery of C. immitis, but it is probably not the most efficient method. A more suitable sampling strategy and method to assess the integrity of the "Hot Lab" is outlined in the section VII of this report[3].

Subsequent to the case of coccidioidomycosis that occurred, the safety committee at the laboratory has revised and improved training and medical surveillance policies. Since 1978 no racial groups are excluded from employment in any area of the facility.

VII. RECOMMENDATIONS

The below recommendations have already, wholly or in part, been implemented in regard to the NBL facility.

1. Standardized and appropriate medical surveillance policies should be adopted.

2. Hiring policies for "Hot lab" personnel should be consistent.

3. Adequate training and information should be provided for all employees.

4. Environmental sampling methods to determine the overall cleanliness and containment features within the laboratories should be reviewed. A comprehensive qualitative environmental sampling program should include the following items:

   a. Designation of areas of "high risk" where organisms should not be found, yet could be present if laboratory techniques or containment procedures and equipment were compromised. These areas should be rated according to degree of risk.

   b. Selection of appropriate sampling mechanisms and media for areas and organisms to be evaluated.to assess the integrity of the "Hot Lab" procedures and environment.

      As a screening test for the air, a single stage slit sampler should be used. Sampling time would depend upon the volume and ventilation in the room. Sabourauds agar, with cycloheximide added for selectivity, should be used as growth media, and the plates should be incubated for at least nine days. Suspect organisms should, after proapagation in nutrient broth, be inoculated into rodents for definitive identification.

In screening for surface contaminants, moistened sterile cellulose sponges should be vigorously rubbed over the designated area, which can have an area of several square meters. The sponge is then introduced into Saborouds dextrose broth with added cycloheximide, incubated and subsequently inoculated into rodents.

5. The use of formaldehyde as a disinfecting agent in laboratory areas merits certain precautions[4][5]. If it is determined that the use of formaldehyde cannot be adequately controlled, a substitute agent should be utilized.

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IX. DISTRIBUTION AND AVAILABILITY

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For the purpose of informing the employees, the employer will promptly "post" this report for a period of thirty (30) calender days in prominent places near where the employees work.

X. REFERENCES

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