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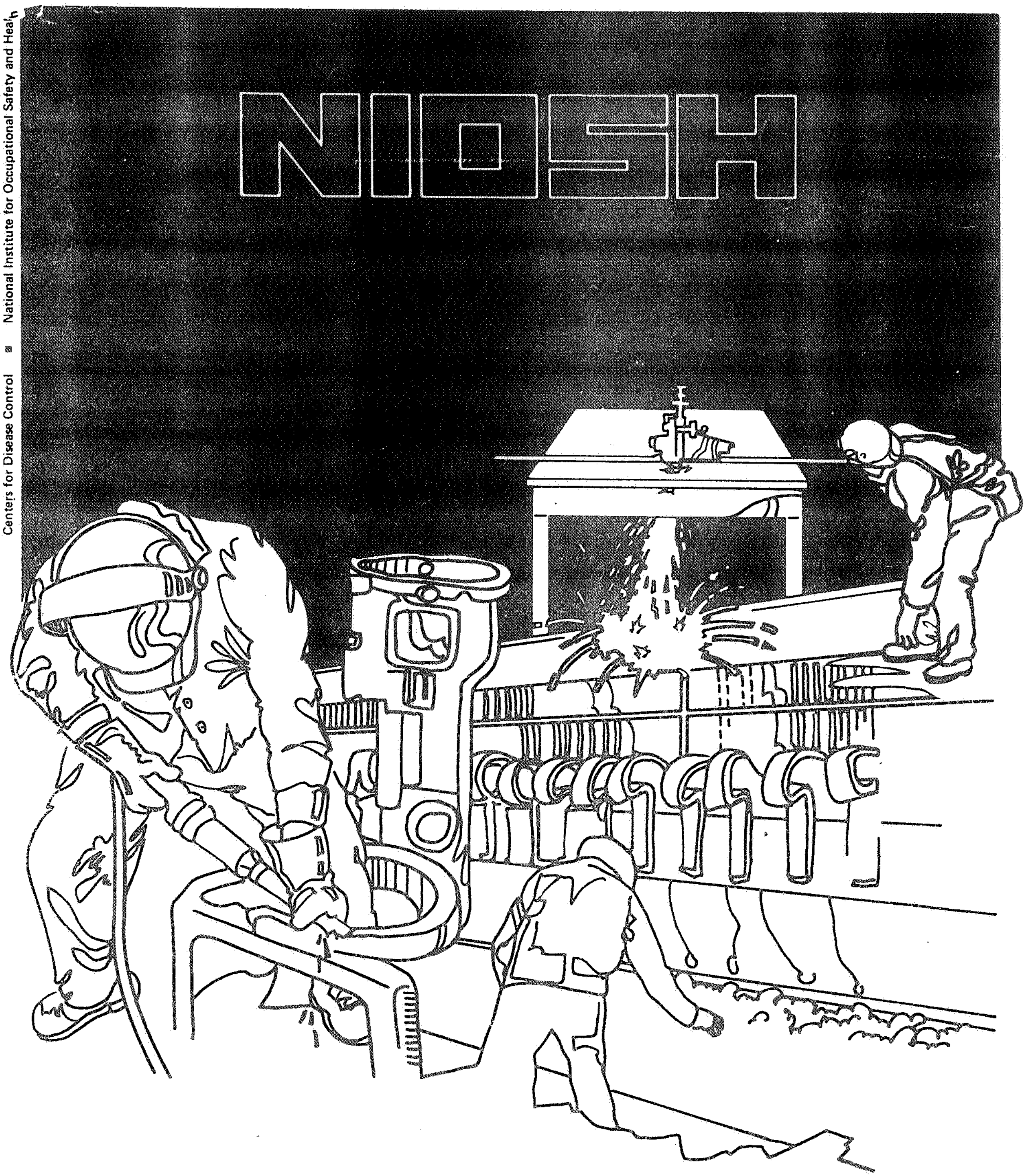

Health Hazard Evaluation Report

HETA 81-359-1058
NATIONAL MARINE FISHERIES SERVICE
SOUTHEAST FISHERIES CENTER
CHARLESTON LABORATORY
CHARLESTON, SOUTH CAROLINA

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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NATIONAL MARINE FISHERIES SERVICE
SOUTHEAST FISHERIES CENTER
CHARLESTON LABORATORY
CHARLESTON, SOUTH CAROLINA

NIOSH INVESTIGATOR:
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I. SUMMARY

On June 15, 1981, the National Institute for Occupational Safety and Health (NIOSH) received a health hazard evaluation request from employees of the Southeast Fisheries Center (SEFC), Charleston Laboratory, National Marine Fisheries Service, National Oceanic and Atmospheric Administration (NOAA) U.S. Dept. of Commerce. The employees had complained of headaches, lightheadedness, nausea, and diarrhea which they felt were related to exposures from solvents and other toxic chemicals handled in their labs. The Charleston Laboratory is a research laboratory which is concerned with the development and safe utilization of fishery products. Approximately 65 employees work at the lab, including supervisory and administrative support personnel plus microbiologists, physical science technicians, chemists, biologists, chemical engineers, lab technicians, and student aides.

NIOSH collected several personal and general area samples for benzene, hexane, chloroform, acetonitrile, methanol, and polychlorinated biphenyls (PCB's). We determined the efficiency of laboratory exhaust ventilation hoods by measuring hood face velocities with a air velocity meter. We also analyzed bulk samples of sprayed-on insulation material and scrapings from fireproof panels lining chemical storage cabinets (Transite) for asbestos content. We conducted private confidential interviews to determine if employees had experienced any adverse health effects which they felt could be work related.

Of all the substances sampled, only chloroform was detectable in the air. Concentrations ranged from 0.1 - 5.1 ppm; no personal exposures, which were 0.1 and 0.9 parts per million (ppm), were detected above the recommended NIOSH limit of 2 ppm. All work with chloroform was being performed under laboratory exhaust hoods. Laboratory hood face velocities were adequate, ranging from 98-282 feet per minute (fpm). NIOSH recommends 100 fpm for most laboratory applications. No asbestos was detected in the sprayed-on ceiling insulation material. Scrapings from Transite panels were found to be 20-30% chrysotile asbestos. Of the 8 employees interviewed, 3 had complained of health effects, including eye irritation, skin irritation, nervousness, and fatigue, which they believed were work related.

Based on the results of environmental sampling and the sufficient exhaust air flow provided by laboratory hoods, NIOSH has determined that exposures to toxic vapors from chemicals used in the labs are not significant as long as these chemicals are used inside the laboratory hoods provided. However, many employees were not familiar with the toxicity of the chemicals with which they were working and had received no formal training in health and safety from their employer. A formal laboratory safety training program should be implemented. Additional recommendations are provided in Section VIII of this report.

KEYWORDS: SIC 7391 (Research and Development Laboratories), acetonitrile, chloroform, asbestos, benzene, hexane, PCB's, methanol, ventilation

II. INTRODUCTION

On June 15, 1981, The National Institute for Occupational Safety and Health (NIOSH) received a confidential request for a NIOSH health hazard evaluation from several employees of the Southeast Fisheries Center (SEFC), Charleston Laboratory, National Marine Fisheries Service, National Oceanic and Atmospheric Administration (NOAA), U.S. Dept. of Commerce. The employees expressed concern about exposures to solvents and pesticides used in the laboratory for chemical analytical purposes. The employees complained of headaches, lightheadedness, nausea and diarrhea; and they felt that these symptoms were related to job exposures. Because the employees working for this agency were not covered by a certified* safety and health committee, NIOSH was authorized to respond to this request in accordance with Title 29 CFR 1960.35(b)(4). In response to this request, an industrial hygiene survey was conducted on August 4-5, 1981. The objectives of the industrial hygiene survey were to: (1) conduct a walk-through tour of the facility, (2) obtain information concerning laboratory procedures, work practices, and materials handled, (3) evaluate environmental controls and laboratory ventilation systems, (4) interview employees about symptoms and health effects which might be work-related and (5) collect air samples of suspected contaminants to determine personal exposures and general area concentrations. An interim report with preliminary findings and recommendations was submitted to SEFC on September 16, 1981.

III. BACKGROUND

The Charleston Laboratory is a research laboratory in which the primary concerns are the development and safe utilization of fishery products. This requires the measurement of contaminants and toxic substances in fish and seafood products, as well as the nutritional composition and nutritional requirements of fish and other commercial marine organisms.

In the laboratory's Marine Contaminants Division, several toxic substances are used as solvents (e.g. benzene, hexane) and contaminant standards. Heavy metals, pesticides (e.g. chlorinated pesticides and Aroclor 1254, a PCB analytical standard), several hydrocarbons, and pathogenic bacteria and viruses are used for analytical measurements of contaminants in fish. Those individuals who work with and around these substances are more susceptible to exposure. In the Marine Contaminants Division there are three subdivisions or branches; and 19 individuals are employed as chemists, physical science technicians, microbiologists, and student aides.

* The term "certified safety and health committee" means a federal agency safety and health committee that meets the provisions of section 1-3 of Executive Order 12196 and of Title 29 CFR Part 1960, Subpart F, as listed and attested to by the head of each agency in writing to the Secretary, U.S. Dept. of Labor.

The Charleston Laboratory's Division of Development and Utilization is mainly concerned with new processes, new products, and the quality of seafood products. The nutritional requirements of seafood animals are also researched in this division. There are four subdivisions or branches of this division, and 27 individuals are employed as physiologists, chemists, biologists, physical science technicians, biological lab technicians, chemical engineers, and student aides.

Normally, laboratory employees work only day shift, 8 hours per day, 5 days per week. A flexitime schedule is authorized which permits employees to arrive for work as early as 7:00 am. To conserve energy, the heating, ventilation, and airconditioning system (HVAC) is operated from 8:00 am to 4:30 pm, 5 days per week.

This modern, single-story laboratory facility was constructed in the late 1970's and was leased by the federal government from the South Carolina Wildlife and Marine Resources Department in the spring of 1978. State employees maintain the building and are responsible for operation and maintenance of the HVAC system.

IV. EVALUATION DESIGN AND METHODS

On August 4, 1981, an opening conference was held with the Charleston Laboratory: (1) Chief, Division of Marine Contaminants and Acting Laboratory Director (during the NIOSH survey), (2) Chief, Division of Development and Utilization, (3) Safety Committee Chairperson, and (4) Chief of Administration. Following the opening conference a complete walk-through tour was conducted of the entire facility. Work practices for handling toxic solvents and pesticides were discussed with the laboratory technicians. The employee requesters of the NIOSH evaluation were especially concerned about the use of chlorinated pesticides, PCB's, and highly toxic solvents such as benzene. Laboratory exhaust hoods had not been tested since the building was occupied in March, 1978. The State inspectors had never provided the results from those tests to Charleston Laboratory personnel. For this reason, the design and effectiveness of laboratory exhaust hood systems were of special interest to the NIOSH investigators. The perchloric acid hood was not evaluated because the exhaust system was not operational. The exhaust ducts had become badly corroded due to the poorly designed wash down system. A build up of explosive perchlorate salts in the exhaust duct was suspected. A request for funds to repair and redesign the system had been submitted by the laboratory director.

A. Environmental Exposure Sampling

At the time of the NIOSH survey, benzene and hexane were being used for fish oil extractions and were used in the "Chemical Analysis II" laboratory (Room 230). All procedures were performed under a laboratory hood.

Chloroform vapors were sampled in the "Lipid Prep." Laboratory (Room 246) and in the "Proximate" Lab (Room 237). Possible exposures to the PCB standard (Aroclor 1254) from contamination of the air or by direct contact with PCB contaminated equipment were sampled in the Chemical Analysis II laboratory. Other solvent vapors sampled included acetonitrile in the Chemical Analysis II Lab and methanol vapors in the Lipid Prep. Lab.

The air samples for benzene, hexane, chloroform, and acetonitrile were collected as both personal and general area samples on activated charcoal sampling tubes. Silica gel sampling tubes were used for methanol samples, and florisil tubes were used to collect PCB samples. Personal exposures were determined by attaching the sample collector tube to the laboratory technician's shirt collar. Area concentrations were monitored by placing the collection device just outside the laboratory hood as close as possible to the source of the vapor or aerosol being sampled. To check for possible work area contamination from PCB's, swipe samples were taken from work surfaces near equipment and glassware where solutions of PCB's were being used.

Bulk samples of insulation material covering structural beams, and scrapings from the edge of Transite panels used for fireproofing of laboratory cabinets, were sent to the NIOSH laboratory for microscopic examination to determine asbestos content.

All samples collected were submitted to the NIOSH contract laboratory and analyzed in accordance with established NIOSH methods (see Table 1).

B. Ventilation

The effectiveness of laboratory exhaust hoods was determined by measuring the face velocities with a Kurz Model 441 air velocity meter. The average of 6-10 flow rate measurements, taken along the face of the hood openings (fully open sash), were compared to NIOSH recommended guidelines.[13]

C. Personal Interviews

Eight personal confidential interviews were conducted with employees from both divisions. Employees were asked if they had experienced adverse health effects or noted symptoms which they felt might be work related.

V. EVALUATION CRITERIA

A. Environmental Criteria

The environmental criteria described below are intended to represent airborne concentrations of substances to which workers may be exposed for eight hours a day, 40 hours per week for a working lifetime without adverse health effects. Because of wide variation in individual susceptibility, a small percentage of workers may experience discomfort from some substances at concentrations at or below the recommended criteria.[1] A smaller percentage may be more seriously affected by aggravation of a pre-existing condition or by a hypersensitivity reaction. The time-weighted average (TWA) exposure refers to the average concentration during a normal 8-hour workday. The Short-Term Exposure Limit (STEL) is the maximum allowable concentration, or ceiling, to which workers can be exposed during a period of up to 15 minutes, provided that no more than four excursions per day are permitted, with at least 60 minutes between exposure periods.

The primary sources of environmental evaluation criteria considered for this study were: 1) NIOSH criteria documents and recommendations, 2) the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLV's)[1], and 3) the U.S. Department of Labor (OSHA) federal occupational health standards (Title 29 CFR 1910). The criteria judged most appropriate for this study are as follows:

Substance	Short Term Exposure Limits	8 - 10 Hour Time Weighted Average	Source
Chloroform	--	50 ppm	OSHA
	50 ppm (A_2)	10 ppm (A_2)	ACGIH
	2 ppm	--	NIOSH
Asbestos	10 f/cc (ceiling)	2 f/cc	OSHA
	--	2 f/cc (A_1)	ACGIH
	0.5 f/cc (15 min)	0.1 f/cc	NIOSH
PCB's (54% chlorine, Aroclor 1254)		0.5 mg/M^3	OSHA
		0.5 mg/M^3	ACGIH
PCB's (all - A_2)	--	0.001mg/M^3	NIOSH
Benzene	25 ppm (10 min)	10 ppm	OSHA
	25 ppm (15 min-A_2)	10 ppm (A_2)	ACGIH
	1 ppm (60 min)	--	NIOSH
Hexane	--	500 ppm	OSHA
Hexane (current)	125 ppm (15 min)	500 ppm	ACGIH
Hexane (proposed)			
(n-hexane)	--	50 ppm	ACGIH
(other isomers)	1000 ppm (15 min)	500 ppm	ACGIH
Hexane	510 ppm (15 min)	100 ppm	NIOSH
Acetonitrile	--	40 ppm	OSHA
	60 ppm (15 min)	40 ppm	ACGIH
	--	20 ppm	NIOSH
Methanol	--	200 ppm	OSHA
	250 ppm (15 min)	200 ppm	ACGIH
	800 ppm (15 min)	200 ppm	NIOSH

A_1 Human Carcinogen, A_2 Suspect Carcinogen
NOTE: ppm = parts per million parts of air
mg/M^3 = milligrams per cubic meter of air
f/cc = asbestos fibers, longer than 5 micrometers, per cubic centimeter of air.

B. Toxicity

The adverse health effects from excess exposure (exposures to airborne concentrations above the evaluation criteria) are summarized below:

1. Hexane

Normal hexane is a mild upper respiratory irritant and causes central nervous system depression. In industry, mild symptoms of narcosis, such as dizziness, have been observed when concentrations exceeded 1000 ppm but not when below 500 ppm. Until recently, chronic effects from hexane and similar hydrocarbons had rarely been reported. However, in 1967, seventeen cases of polyneuritis were reported among workers exposed to n-hexane at concentrations between 500 - 1000 ppm. Subsequent animal studies demonstrated functional disturbances of the peripheral nerves of mice at 250 ppm but not at 100 ppm.[2] Other studies reported n-hexane neuropathy among furniture workers and among workers exposed to n-hexane used as a solvent in plastic cements. It has been postulated that 2,5-hexanedione, a metabolite of n-hexane, is the neurotoxic agent.[3]

2. Chloroform

Chloroform vapor is a central nervous system depressant and is toxic to the liver and kidneys. Short term exposure to chloroform vapor may cause headache, drowsiness, vomiting, dizziness, unconsciousness, irregular heart beat, and death. When splashed in the eye, chloroform causes pain and irritation. Prolonged exposure at concentrations of 80-240 ppm has been reported to cause lassitude, digestive disturbances, and mental dullness. Of 68 chemical workers exposed regularly to concentrations of 2 - 205 ppm from 1 to 4 years, approximately 25% had hepatomegaly (enlarged livers). This group of workers was also found to be more sensitive to viral hepatitis than the general population. A bioassay of chloroform conducted by the National Cancer Institute found that chloroform has the ability to to cause kidney epithelial tumors in rats and hepatocellular tumors in mice. The bioassay confirmed the studies of Exchenbrenner[4] and of Exchenbrenner and Miller[5] who found hepatocellular carcinoma in exposed male and female mice. Because of these findings, NIOSH has recommended that the permissible exposure limit (OSHA standard) be reduced to a ceiling level of 2 ppm, averaged over a one-hour period, and that chloroform be regulated as an occupational carcinogen.[6]

3. Asbestos

Asbestos is a generic term applied to a number of hydrated mineral silicates, including chrysotile, amosite, crocidolite, tremolite, and anthophyllite. Exposure to asbestos was initially associated with asbestosis, a lung disorder characterized by a diffuse interstitial fibrosis. As the disease progresses the patient exhibits restrictive pulmonary function. Once established, asbestosis progresses even after the exposures have ceased. More recently exposure to asbestos has been associated with lung cancer and to a rare cancer of the pleura and peritoneum, the membranes lining the lung and abdominal cavities. Excess incidences of cancer of the esophagus, stomach, colon, and other organs have also been associated with asbestos.[3] Although available data show that the lower the exposure, the lower the risk of developing asbestosis and cancer, excessive cancer risks have been demonstrated at all fiber concentrations studied to date. A joint NIOSH/OSHA committee was established in the fall of 1979 to review the scientific information and assess the adequacy of the current OSHA standard. The evaluation of all human data provided no evidence for a threshold or for a "safe" level of asbestos exposure. Accordingly, the committee recommended that exposures be controlled to the maximum extent possible. The current limit recommended by NIOSH (0.1 fiber/cc) is considered the lowest level of exposure detectable using currently available analytical techniques.[7]

4. Benzene

Acute benzene exposure causes central nervous system depression. Human exposure to a very high concentration (20,000 ppm) was fatal in 5-10 minutes. Brief exposure to concentrations above 3000 ppm is irritating to the eyes and respiratory tract; continued exposure may cause euphoria, nausea, staggering gait, and coma. Inhalation of lower concentrations (250-500 ppm) causes vertigo, drowsiness, headache, and nausea. The most significant toxic effect of benzene exposure is an insidious and often irreversible injury to the bone marrow. Long term exposures to benzene have been observed to have an initial stimulant effect on the bone marrow, followed by aplasia and fatty degeneration. As a result, changes to the blood occur which initially begins as an increase followed by a decrease of the erythrocytes (red blood cells), leucocytes (white blood cells), and platelets with progression to aplastic anemia, leukopenia, pancytopenia, and thrombocytopenia.[3] Recent epidemiologic studies along with case reports have lead NIOSH to conclude that benzene is also leukemogenic.[8]

5. Polychlorinated Biphenyls (PCB's)

Chlorodiphenyl - 54% chlorine, (a polychlorinated biphenyl, or PCB) is toxic to the liver of animals, and severe exposure may produce a similar effect in humans. Largely because of their chemical stability, resistance to biodegradation, and lipid solubility, PCB's have become significant contaminants of global ecosystems. Toxicity studies have concentrated on the effects of contaminations of diets with small amounts of various PCB's. PCB's are poorly metabolized and tend to accumulate in the body, especially in fat tissues.[2] NIOSH recognizes all PCB's as potential carcinogens and recommends an occupational exposure limit of 0.001 mg/M^3 in air. This recommendation is based on data from animal studies which have shown PCB's to be carcinogenic and teratogenic, and hence potentially carcinogenic and teratogenic in man.[9] The NIOSH limit is considered to be the lowest concentration which can be reliably measured by currently available sampling and analytical methods.

6. Acetonitrile

Acetonitrile is a chemical asphyxiant due to its inhibitory action on metabolic enzyme systems. Short term exposure (4 hours) to concentrations of 160 ppm has been reported to cause a slight flushing of the face and a feeling of chest tightness. Inhaling acetonitrile may cause irritation of the nose and throat. Severe exposure to very high concentrations may cause such effects as nausea, vomiting, respiratory depression, weakness, chest or abdominal pain, vomiting blood, convulsions, shock, unconsciousness, and death.[6] In most cases there is a latent period of several hours between exposure and onset of symptoms. It is believed that acetonitrile has relatively little direct toxic effect and that its delayed response is due to the slow release of cyanide ions into the blood stream.[10] The ACGIH TLV was established to protect against organic cyanide poisoning and injury to the respiratory tract.[2] The NIOSH's recommended exposure limit is 20 ppm which is believed to provide a better margin of safety in preventing complaints of chest tightness.[11]

7. Methanol (methyl alcohol)

Swallowing methyl alcohol or breathing very high concentrations of methyl alcohol may produce headache, weakness, drowsiness, lightheadedness, nausea, vomiting, drunkenness, and irritation of the eyes, blurred vision, blindness, and death. Prolonged exposure to higher concentrations may result in headaches, burning of the eyes, dizziness, sleep problems, digestive disturbances, and failure of vision. Repeated or prolonged skin exposure may cause irritation.[6] The signs and symptoms most characteristic of methanol poisoning are various visual disturbances and metabolic acidosis.[12] The NIOSH recommended exposure limit of 200 ppm, as a time weighted average, is the same as the ACGIH TLV of long standing and is also the current OSHA standard.

C. Laboratory Hood Ventilation

According to NIOSH's Recommended Industrial Ventilation Guidelines Manual,[13] the hood applications and minimum exhaust velocity requirements for laboratory hoods based on contaminant class are as follows:

Contaminant Class	Face Velocity Minimum	Face Velocity Average
I - Substances with exposure limits of 100 ppm and above. (e.g., methanol)	50 fpm	100 fpm
II - Substances with exposure limits of 1 ppm and above (up to 100 ppm) (e.g., acetonitrile)	75 fpm	100 fpm
III - Substances with exposure limits below 1 ppm; also radioisotopes, carcinogens, and cancer suspect agents. (e.g., benzene)	125 fpm	150 fpm

Note: fpm = feet per minute

VI. RESULTS

A. Air Sampling Results

Results of the air samples taken during the survey are presented in Table 2. Of all the substances sampled, only chloroform was detectable in the air. Concentrations ranged from 0.1 - 5.1 ppm; no personal exposures, which were 0.1 and 0.9 ppm, were detected above the recommended NIOSH limit of 2 ppm. All work with chloroform was being performed under laboratory exhaust hoods. The samples for benzene, hexane, and methanol represent full shift exposures. The samples for chloroform represent the average concentration over a 1 hour sampling period as recommended by NIOSH criteria for evaluating chloroform exposure hazards (see Table 1). No personal exposures to methanol, PCB's, benzene, hexane, and acetonitrile were detected during the survey.

No asbestos was detected in the sprayed-on ceiling insulation material. However, scrapings from transite panels was found to be 20-30 % chrysotile asbestos.

B. Laboratory Ventilation Hood Measurements

The results of laboratory hood measurements are presented in Table 3. The average hood face velocities ranged from 98 feet per minute (fpm) to 282 fpm. As discussed in section V, NIOSH considers 100 fpm to be adequate for controlling vapors from all except the most hazardous materials, i.e., substances with airborne exposure limits below 1 ppm, carcinogens, etc.; in this case, NIOSH recommends 150 fpm and a minimum of 125 fpm. None of the face velocities measured on hoods used for handling chloroform or benzene (considered by NIOSH as carcinogens) were below the recommended minimum.

C. Employee Interview Results

Of the eight personal interviews conducted, three employees experienced symptoms which they felt were job related. The symptoms the employees believed to be most frequently associated with work were eye irritation, skin rash, nervousness, and fatigue. Another employee experienced occasional symptoms of headache, sore throat, and nasal congestion, but these were not believed to be job related. The remaining four employees reported no symptoms. Only one employee reported having received training on safe handling of toxic or hazardous chemicals. No formal training programs on laboratory safety had been provided to the employees by the Charleston Laboratory staff.

D. Previous Illness Reported in Accident/Injury Records

During 1980, a female employee reported she had suffered an allergic reaction to malathion which had been used to spray office plants. Symptoms treated were nasal congestion and an infection to the middle ear. Her doctor recommended that the lab discontinue spraying with malathion. Also in 1980, a male employee was burned with acid when a dispenser nozzle came off during operation. A safety clip had not been used. The only other reports on file were records of accidents which occurred in 1978. One man burned his right eye when a piece of glassware dropped in a solution of 40% nitric acid, splashing the acid in his eye. Another employee had experienced sinus congestion and sore throat which was believed the result of chloroform exposure.

VII. DISCUSSION AND CONCLUSIONS

From observing the analytical procedures used to extract and analyze substances from seafood products, and considering the adequate face velocities measured for the laboratory hoods, it does not appear that the amount of vapor released would be sufficient to escape from the laboratory hoods in concentrations above the recommended exposure limits. This conclusion is supported by the results of atmospheric sampling which indicate that toxic vapors, except for chloroform, are non-detectable outside the laboratory hoods. No solvent odor was noted in the labs during the survey, and laboratory procedures observed were conducted by the proper use of chemicals under a hood.

Laboratory hood air flow was adequate, and each hood was equipped with an auxiliary make-up air supply system. However, one problem frequently observed was condensation collecting on the hood window sash when warm outside make-up air contacts cool surfaces of the hood and glassware inside the hood. Employees complained that at times the condensation is so bad, experimental results can be affected. Under these conditions, employees might be tempted not to operate or use the hoods.

It is important to note that of the employees interviewed, none were familiar with OSHA's requirements for establishing federal agency occupational safety and health programs. They were also not familiar with the toxicity of the chemicals with which they were working and had received no formal training in health and safety from their employer. Laboratory supervisors are responsible for providing all information and training on the safe handling, storage, and disposal of hazardous materials, but it appears that such training is not always conducted by every supervisor. Not even members of the laboratory safety and health committee had received any special laboratory safety training since being assigned to the committee. None of the committee members were familiar with the basic program elements for federal employee occupational safety and health programs as required by Title 29 CFR, Part 1960 and Executive Order 12196.

VIII. RECOMMENDATIONS

1. A program should be established for compliance with Title 29 CFR Part 1960 regulations. It is the responsibility of the SEFC's "Designated Safety and Health Official" (DSHO) to insure that the basic program elements of Title 29 CFR Part 1960 are fully implemented and operational at the working level. At the time of the NIOSH survey this function had been assigned, as a collateral duty, to the SEFC Regional Safety Officer, who should have received from the Safety Manager for the NOAA, the necessary training and guidance to carry out such a program. Employees were not even aware the SEFC had a DSHO; if they were, it is likely that NIOSH would not have been required to investigate the Charleston Laboratory. Employee complaints should be handled through official channels of communication to the DSHO's. As required by Title 29 CFR Part 1960, the names of the complainants would have been kept confidential.

2. The members of the safety committee should receive some form of training in laboratory safety and occupational health. Laboratory technicians should also be included as members of the safety committee. The Safety Committee should consider offering training programs to other laboratory personnel on laboratory safety, such as the toxicity of common laboratory chemicals, as a part of the "brown bag seminar" series. A number of films, filmstrips, and videotapes are available on the subject, and many are available from the Centers for Disease Control, Laboratory Training and Consultation Division (see Attachments 1 & 2). The American Chemical Society sponsors laboratory safety training seminars, which are conducted in several locations across the country each year. NIOSH also offers a course in laboratory safety.

3. All laboratory hoods should be inspected quarterly or semi-annually. Chemicals not in use should be stored in the ventilated cabinets located under the hoods. Chemicals should

not be stored inside the laboratory hoods. This practice interferes with the air flow in the hood, clutters up the work space, and increases the amount of materials that could become involved in a hood fire.

4. A non-reactive sealent should be applied to the edges of all Transite panels to prevent asbestos fibers from becoming airborne.

5. Information on toxicity, safe handling, and disposal of hazardous materials and chemicals used in the labs should be readily available to all laboratory supervisors, chemists, and technicians. Material Safety Data Sheets (MSDS) should be compiled, maintained, and kept readily available to employees for each substance used in the laboratory. Attachment 3 is an example of a MSDS developed by the IBM Corporation.

6. The SEFC Safety Committee should begin to develop a comprehensive laboratory safety program. Attachment 4 is a compilation of program elements and performance criteria for establishing a laboratory safety program. This guidance was developed during a national audit of selected Environmental Protection Agency (EPA) laboratories.

IX. AUTHORSHIP AND ACKNOWLEDGEMENTS

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X. DISTRIBUTION AND AVAILABILITY

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 ninety (90) days the report will be available through the National Technical Information Service (NTIS), Springfield, Virginia 22161. Information regarding its availability through NTIS can be obtained from the NIOSH Publications Office at the Cincinnati, Ohio address.

Copies of this report have been sent to:

1. Employee requesters (confidential)
2. Director, NMFS, SEFC, Charleston Labortory
3. U.S. Department of Labor, OSHA, Region IV
4. TEC/FAP, OSHA, Region IV
5. NIOSH, Region IV
6. South Carolina Dept. of Labor, DOSH
7. South Carolina Dept of Health and Envir. Control
8. Safety Manager, U.S. Dept. of Commerce, NOAA

For the purpose of informing the approximately 65 "affected employees", the employer will promptly "post" this report for a period of thirty (30) calendar days in a prominent place(s) near where the affected employees work.

XI. REFERENCES

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AIR SAMPLING AND ANALYSIS METHODOLOGY
SOUTHEAST FISHERIES CENTER
CHARLESTON LABORATORY
CHARLESTON, SOUTH CAROLINA
HETA 81-359

August 4-5, 1981

Substance	Collection Device	Flow Rate	Analysis	Detection limit	Analytical Method
Chloroform	Charcoal Tube	750 cc/min.	Gas Chromatography (flame ion. det.)	10 ug/sample	S351 (a)
Asbestos	Bulk Sample	N/A	Polarized Light Microscopy	2-3 percent	(b)
PCB's	Florisil Tube	200 cc/min.	Gas Chromatography (elec. capture det.)	0.05 ug/sample	(c)
PCB's	Smear Tabs	(Swipe Sample)	"	0.05 ug/sample	(c)
Acetonitrile	Charcoal Tube	200 cc/min.	Gas Chromatography (flame ion. det.)	10 ug/sample	S165 (1)
Benzene	Charcoal Tube	100 cc/min.	"	2 ug/sample	127 (2)
Hexane	Charcoal Tube	100 cc/min.	"	10 ug/sample	127 (2)
Methanol	Silica Gel Tube	100 cc/min.	"	20 ug/sample	S59 (3)

ug = micrograms

(a) Sampled at 750 cc/min. for one hour as recommended by the NIOSH Criteria Document - Occupational Exposure to Chloroform (Revised), 1976
(b) Percent asbestos in bulk sample visually estimated by using polarized light microscope and dispersion staining techniques.
(c) Toluene desorption, analyzed by GC(FID) - 6'x1/4" (4mm i.d.) glass column with 3% QF - 1/3% OV-17 on 100/200 mesh gas chrom Q isothermally at 220° C; Carrier gas - 5% methane in argon at 75 mL/minute.
(1) NIOSH Manual of Analytical Methods, Second Edition, Vol. 3, DHEW, (NIOSH) Publication No. 77-157-C
(2) NIOSH Manual of Analytical Methods, Second Edition, Vol. 1, DHEW, (NIOSH) Publication No. 77-157-B
(3) NIOSH Manual of Analytical Methods, Second Edition, Vol. 2, DHEW, (NIOSH) Publication No. 77-157-A

TABLE 2
SOUTHEAST FISHERIES CENTER
CHARLESTON LABORATORY
CHARLESTON, SOUTH CAROLINA
August 4-5, 1981

CHLOROFORM SAMPLING RESULTS

Job Description/Location	Type Sample	Duration (min.)	Concentration (ppm)
Chemist/Lipid Preparation	Personal	62	0.1
Lipid Prep. Lab.	Area	63	0.9
Phy. Sci. Tech./Proximate Lab.	Personal	27	None Detected
Proximate Lab.	Area	32	5.1
NIOSH Evaluation Criteria - 60 min. time weighted average =			2.0

METHANOL SAMPLING RESULTS

Job Description/Location	Type Sample	Duration (min.)	Concentration (ppm)
Chemist/Lipid Preparation	Personal	66	None Detected
Lipid Prep. Lab.	Area	66	None Detected

PCB SAMPLING RESULTS

Job Description/Location	Type Sample	Duration (min.)	Concentration (ppm)
Phy Sci. Tech./Chem. Anal. II Lab.	Personal	50	None Detected
Top of GC, Chem. Anal. II Lab.	Area	65	None Detected
Top of GC, Chem. Anal. II Lab.	Wipe	N/A	None Detected
Inside lab hood, Chem. Anal. II	Area	N/A	None Detected

BENZENE & HEXANE SAMPLING RESULTS

Job Description/Location	Type Sample	Duration (min.)	Concentration (ppm)
Chemist/fish oil extraction	Personal	353	None Detected
Between lab hoods/fish oil ext.	Area	353	None Detected
Research Chem./Chem. Anal. II	Personal	333	None Detected
Phy. Sci. Tech./Chem. Anal. II	Personal	88	None Detected
Student Aid/Chem. Anal. II	Personal	330	None Detected
Student Aid/Chem. Anal. II	Personal	326	None Detected

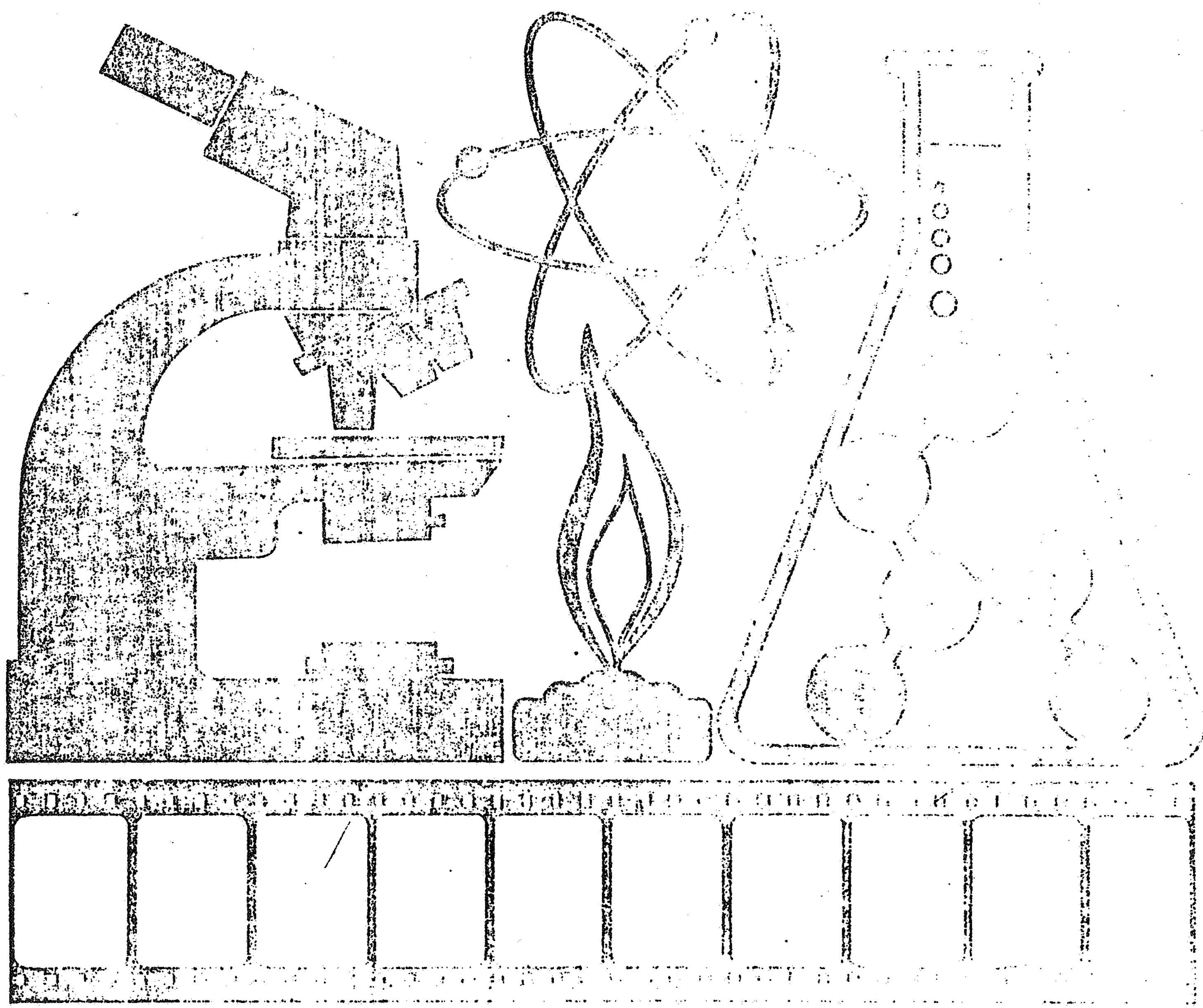
ACETONITRILE SAMPLING RESULTS

Job Description/Location	Type Sample	Duration (min.)	Concentration (ppm)
Phy. Sci. Tech./Chem. Anal. II	Personal	296	None Detected
Chemical Analysis II Lab.	Area	300	None Detected

TABLE 3
CHARLESTON LABORATORY
CHARLESTON, SOUTH CAROLINA
August 4-5, 1981
LABORATORY HOOD VENTILATION AIR FLOW DATA
(hood window sash fully open)

Hood No.	Location/Room #	Average Face Velocity (feet per minute)	Comments
39	Nutrition Chemistry/219	192	
40	Biochemistry Lab./220	192	
42	"	216	
36	Food Process I/229	188	
?	Chem. Anal. II Lab./230	104 ----------	Bottom slot exhaust partially obstructed with bottles
30	Sample Prep. Lab./236	180 ----------	side toward room 238
30	"	169 ----------	side toward room 234
27	Proximate Lab/237	204	
25	"	157	
?	"	98 ----------	Labconco Hood
24	"	118 ----------	Air flow partially blocked by temp. bath
29	Wash & Process/238	196	
17	General Chemistry/242	168	
18	"	143	
20	Chromatography Prep./243	233	
13	Lipid Prep. Lab./246	176 ----------	Lower slot exhaust partially obstructed with bottles
16	Pesticides Prep. Lab./247	125 ----------	Large hood containing rotary evaporator for fish oil extractions
15	"	153 ----------	Standard sized hood
12	Microbial Physiology/248	188	
11	Media Prep./251	235	
10	Microbiology Q.C./256	282	

Guide to Educational Resources For Laboratorians



U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES / Public Health Service / Centers for Disease Control

ATTACHMENT No. 1

Guide to Educational Resources For Laboratorians

Editor:

Pegi Brooks, Ph.D., Education Specialist
Laboratory Training and Consultation Division

June 1981

U.S. Department of Health and Human Services
Public Health Service
Centers for Disease Control
Laboratory Improvement Program Office
Atlanta, Georgia 30333

SAFETY

CONTROLLING INFECTIOUS AEROSOLS: PART I. PRECAUTIONS IN MICROBIOLOGY.

16mm MP/Videocassette. 15 min. CDC.

Demonstrates common hazards in the microbiological laboratory and shows how these hazards produce infectious aerosols. Identifies factors which determine infection in the laboratory and discusses ways of avoiding infection. (M-501) (V-501)

CONTROLLING INFECTIOUS AEROSOLS: PART II. MINIMIZING EQUIPMENT-RELATED HAZARDS.

16mm MP/Videocassette. 15 min. CDC.

Discusses use and maintenance of equipment in the microbiological laboratory. Demonstrates proper use of aerosol-free blender and centrifuge in preventing contamination. Demonstrates use of negative pressure (Class I) and laminar flow (Class II) biological safety cabinets in reducing exposure to infectious agents. (M-502) (V-502).

FIRE EXTINGUISHING EQUIPMENT.

Filmstrip; audiocassette. TRAINEX.

Types of fire extinguishers, including the water hose, are shown, and the proper choice for different types of fires is explained and illustrated. Also included are activation, readiness, and fire-fighting procedures.

HANDLING AND STORING CHEMICALS SAFELY.

24 35mm slides; audiocassette; handout. SHL.

Recommended ways for laboratory handling, storage and disposal of chemicals are presented. CDC-79-63.

HOW'S YOUR SAFETY PROFILE?

Filmstrip; audiocassette. TRAINEX.

There are no safe places; they are only occupied by safe people. This theme is carried throughout this colorful, humorous filmstrip. Humorous, yes - because humor is an effective teaching device. Funny, no - because there is nothing funny about a fall from a ladder, contracting hepatitis from a contaminated syringe, or suffering lung damage from inhalation of caustic fumes. These are just a few of the danger areas discussed by a unique cartoon character who guides the viewer of various ways to evaluate his or her own safety profile and avoid becoming an accident statistic.

LABORATORY DESIGN FOR MICROBIOLOGICAL SAFETY.

16mm mp; 34 min; sd; color. NMAC.

Illustrates building features and devices used to provide effective microbiological containment.

LAB SAFETY.

16mm mp; 12 min; sd; color. INDIANA.

Outlines safety procedures to follow when accidents occur in a chemistry lab.

OPERATION OF THE LAMINAR FLOW BIOLOGICAL SAFETY CABINET.

Videocassette; 22 min. CDC.

Compares the various safety cabinets available to the clinical laboratorian; focuses on the safe, effective use of the Class II Laminar Flow Cabinet, stressing the role and responsibilities of the researcher. (V-533).

SAFETY IN THE CLINICAL LABORATORY.

Study guide; 44 pp. NCCE.

This self-instructional unit presents OSHA safety standards for common laboratory equipment, chemicals, radioactive components, and infectious materials, the use of safety equipment including fire extinguishers; and the proper process for accident reports.

SAFETY IS A MATTER OF VIGILANCE.

Filmstrip; audiocassette. Trainex.

This filmstrip program proposes the interesting premise that safety is simply a matter of vigilance. In full-color, dramatic photography, it examines the activities in the laboratories, respiratory therapy, anesthesia, operating room, physical therapy, and occupational therapy. Pointing out accident hazards in each department, it shows how they can be avoided through constant vigilance.

SAFETY MANAGEMENT IN THE LABORATORY.

37 35mm slides; audiocassette; handout. SHL.

Discusses safety regulations and requirements recently placed upon laboratories by organizations such a CAO and OSHA and some of the hazards frequently seen in laboratories. Presents the responsibilities for safety placed upon management, supervisors, and employees, and develops elements of a laboratory safety program. CDC-76-24.

SPECIAL ASPECTS OF RADIOLOGICAL SAFETY: PART I - RADIOLOGICAL SAFET

16mm mp; 31 min; sd; color. NMAC.

Discusses hazards of working with radioactive material. Discusses biological effects of radiation-short-and long-term somati effects-with emphasis on long-term effects on occupational workers. Shows the maximum permissible radiation dosage and explains how exposure to radioactive material is measured. Lists the regulations whi provide information about working wi radioactive material.

SPECIAL ASPECTS OF RADIOLOGICAL SAFETY: PART II - PROTECTION, DECONTAMINATION, AND DISPOSAL.

Videocassette. 56 min; sd; color. NMAC.

Discusses radiation safety practices in typical laboratories. Focuses on external and internal radiation protection and disposal of radioacti waste materials. Explains how to survey for contamination using a Geiger-Mueller counter and smear method and gives ways to decontamina persons and surfaces. Discusses disposal methods and cites regulatio controlling the process.

NEW DEVELOPMENTS IN RIA AND THYROID TESTING: WHAT DO THE RESULTS MEAN?

Workshop; 1 day. CACMLE.

This course will review the principles of radioimmunoassay (RIA) and techniques for acquiring reproducibility and accuracy with this methodology, incorporating the new developments in thyroid function evaluation. New RIA procedures, such as Free T_4 and Neonatal T_4, will be discussed, including the diagnostic screening of thyroid function, followup testing and interpretation of thyroid testing results by the physician.

RADIOISOTOPES AND THYROID FUNCTION.

Workshop. 3 hours. AMES.

Wet workshop designed to transfer basic information in respect to isotopes as well as the thyroid gland.

RIA METHODOLOGY: TWO APPROACHES: TSH AND DIGOXIN RIA.

Workshop; 1 day. NML.

Covers the basic steps in typical RIA procedures with emphasis on major components of assays (antigens, radiolabeled antigens and antibodies). Separation methods and calculation of results are also detailed.

THYRODYNAMICS.

Workshop; 5 hours. AMES.

An intermediate to advanced workshop designed for the practicing laboratory worker, pathologist or physician.

Topics range from a quick review of isotopes and radioactivity to a detailed discussion of thyroid physiology, function, dysfunction, testing, and principles of radioimmunoassay. The program is a wet/dry workshop utilizing case histories and specimens which allows the participant to relate disease states to tests on thyroid function, and may include T3 Uptake, T3 (RIA), and T4 (RIA).

Technical Training participation requires 25-35 practicing technicians. It may also be presented by the Ames thyroid specialists. This program is not recommended for students.

SAFETY

LABORATORY SAFETY MANAGEMENT.

Workshop; 3 days. CDC(9008-C).

The principal hazards--mechanical, electrical, biological, radiological, and fire--are discussed in this course. The students conduct a safety inspection, and they prepare a safety program for their own laboratories.

CDC Laboratory Update

Laboratory Training and Consultation Division Audio-Visual Training Aids

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
CENTERS FOR DISEASE CONTROL
ATLANTA, GEORGIA 30333

ATTACHMENT No. 2

TABLE OF CONTENTS

Reprinted March 1980
Revised April 1980
Revised September 1980
Revised February 1981

Each sound slide presentation listed below consists of 2 x 2 color slides, a tape cassette, and a handout. The programs run approximately 30 minutes and require only a standard cassette player, 35mm slide projector and screen. These are available from your state Public Health Laboratory at the address shown on page 24.

GENERAL

CDC-76-24 Safety Management in the Laboratory
Dr. John Forney (43 minutes, 37 slides, 8 page handout)

Discusses safety regulations and requirements recently placed upon laboratories by organizations such as CAP and OSHA and some of the hazards frequently seen in laboratories. Presents the responsibilities for safety placed upon management, supervisors, and employees, and develops elements of a laboratory safety program.

CDC-78-37 Controlling Infectious Aerosols in the Laboratory
Dr. John Forney (26 minutes, 24 slides, 11 page handout)

Illustrates principal causes of aerosols in the laboratory. Shows proper use of laboratory equipment such as centrifuges, pipettes, blenders and biological safety cabinets.

CDC-78-38 Selection and Use of Kits in the Clinical Laboratory
Mr. Henry Colvin (16 minutes, 19 slides, 4 page handout)

Presents suggestions for facilitating the selection of an appropriate kit for your laboratory from among the many currently available. Includes what to expect from the manufacturer, what to do on receipt, how to incorporate the use of a kit in your routine operation, and how to handle problems.

CDC-79-63 Handling and Storing Chemicals Safely
Dr. John Forney (28 minutes, 24 slides, 5 page handout)

Recommended ways for laboratory handling, storage and disposal of chemicals are presented.

CDC-80-80 The Fluorescent Microscope
Mr. Stanley M. Dever (36 minutes, 28 slides, 10 page handout)

Discusses common problems encountered in the operation of fluorescent microscopes. Topics covered include safety, units that fail to start, improper handling of lamps, and alignment.

CDC-80-84 The Medicare Survey Process in Hospital Laboratories. Part 1. Background and Introduction
Mrs. Martha Forney

Presents a brief history of Medicare. Outlines certification requirements, types of surveys, and surveyor affiliation. Discusses hospital laboratory regulations that were in effect prior to November 1978.

CDC-80-97 Laboratory Use of Radioactive Material. Part 1. Basic Concepts

Dr. William Wagner (34 minutes, 23 slides, 8 page handout)

Discusses sources and types of radiation, radiation emissions, radioactive decay, and radiation units. Presents principles and definitions as a basis for future lectures on laboratory contamination, laboratory monitoring, radioactive waste disposal and nuclear counting.

CDC-80-104 Analytical Methods in Laboratory Management. Part 1. Productivity: Measurement and Analysis

Mr. Cecil Duncan (34 minutes, 25 slides, 12 page handout)

Includes topics such as the productivity model, inputs and outputs, types of man-hours, productivity standards, and calculating staff required.

BACTERIOLOGY

CDC-80-2 Anaerobic Bacteriology in the Clinical Laboratory

Dr. V.R. Dowell and Dr. Gilda Jones (38 minutes, 27 slides, 16 page handout)

Gives some of the important diseases caused by anaerobic bacteria. Covers selection, collection, and transport of clinical specimens, as well as primary isolation media and use of anaerobic systems.

CDC-76-9 The Role of the Clinical Microbiology Laboratory in Surveillance and Control of Nosocomial Infections

Dr. Theo Hawkins and Mr. George Mallison (39 minutes, 24 slides, 8 page handout)

Demonstrates that laboratory reports are an important surveillance tool for detection of hospital-acquired infection and serve as a basis for initiating culture surveys of patients, hospital personnel, and the environment to investigate nosocomial outbreaks.

CDC-77-13 Isolation and Identification of Streptococci. Part I. Collection, Transport and Determination of Hemolysis

Dr. R.R. Facklam (33 minutes, 22 slides, 10 page handout)

Emphasizes two methods of determining the hemolytic activity of the streptococci. Discusses various methods of processing throat and skin swabs, reasons for identifying and isolating the various streptococci, and collection and transport methods. Gives a brief summary on the merits of selective media.

CDC-77-14 Isolation and Identification of Streptococci. Part II. Extraction and Serological Identification

Dr. R.R. Facklam (29 minutes, 11 slides, 12 page handout)

Discusses extraction and grouping methods as well as the limits of usefulness of the serological capillary precipitin and fluorescent antibody and their reagents.

VIDEOTAPES

The following videotapes produced by the Laboratory Training and Consultation Division are available for short-term loan from your State Public Health Laboratory at the address shown on page 24. Video requests made to any state not participating in the videotape program will be forwarded to CDC.

16mm films (indicated by M-) are available from:

Centers for Disease Control
Attn. Joan K. Miller
Laboratory Training and
Consultation Division
Building 3, Room B16
Atlanta, Georgia 30333

Please order by title and number at least three weeks in advance of show date, and mark your priorities when making multiple requests. You may reproduce these training aids with the credits intact.

SAFETY

CONTROLLING INFECTIOUS AEROSOLS: PART I. PRECAUTIONS IN MICROBIOLOGY. (M-501) (V-501)

15 minutes - with booklets

Demonstrates common hazards in the microbiological laboratory and shows how these hazards produce infectious aerosols. Identifies factors which determine infection in the laboratory and discusses ways of avoiding infection. Credits: John E. Forney, Ph.D. and George P. Kubica, Ph.D.

CONTROLLING INFECTIOUS AEROSOLS: PART II. MINIMIZING EQUIPMENT-RELATED HAZARDS. (M-502) (V-502)

15 minutes - with booklets

Discusses use and maintenance of equipment in the microbiological laboratory. Demonstrates proper use of aerosol-free blender and centrifuge in preventing contamination. Demonstrates use of negative pressure (Class I) and laminar flow (Class II) biological safety cabinets in reducing exposure to infectious agents. Credits: George P. Kubica, Ph.D. and John E. Forney, Ph.D.

OPERATION OF THE LAMINAR FLOW BIOLOGICAL SAFETY CABINET (V-533)

22 minutes

Compares the various safety cabinets available to the clinical laboratorian; focuses on the safe, effective use of the Class II Laminar Flow Cabinet, stressing the role and responsibilities of the researcher. Credits: John E. Forney, Ph.D., Renee Black, and Pegi Brooks, Ph.D.

BACTERIOLOGY

HANDLING THE TOOLS OF YOUR TRADE. (V-506)

28 minutes

Demonstrates the proper and safe use of tools commonly employed in the mycobacteriology laboratory, such as pipetting devices, screw cap tubes, quadrant Petri dishes, inoculating turntables, and inoculum spreaders. Credits: George P. Kubica, Ph.D. and Bobby E. Strong, M.S.

IBM MATERIAL SAFETY DATA SHEET

SHADED AREAS - IBM USE ON

SECTION I IDENTIFICATION

MANUFACTURER'S NAME AND FSCM (Federal Supply Code for Manufacturers)	EMERGENCY TELEPHONE NO
ADDRESS (Number, Street, City, State & Zip Code)	DATE
MANUFACTURER'S CONTACT FOR INFORMATION & CLARIFICATION NAME TITLE	IBM MATERIAL ID NO.
ADDRESS STREET CITY STATE ZIP CODE	TELEPHONE NUMBER

CHEMICAL NAME	TRADE NAME
SYNONYMS 1.	SYNONYMS 1.
2.	2.
CHEMICAL FAMILY	FORMULA

FEDERAL STOCK NUMBER (FSN)	GROSS WEIGHT (Kg)	OUTSIDE PACKAGE DIMENSIONS (Meters) Length Width Height

NATIONAL FIRE PROTECTION ASSOCIATION STD 704 M SIGNAL

Health____ Flammability____ Reactivity____ Corrosiveness____ Specific Hazard ____

SECTION II INGREDIENTS

COMPONENT	IBM MATERIAL IDENTIFICATION	% BY WT.	% BY VOL.	THRESHOLD LIMIT VALUE PPM	Mg/M^3	YEA

SECTION III PHYSICAL DATA

BOILING POINT ____ °c (____ °f)	SPECIFIC GRAVITY (H_2O = 1)	VAPOR PRESSURE (mmHg)	PERCENT VOLATILE BY VOLUME
VAPOR DENSITY (AIR = 1)	EVAPORATION RATE = 1	SOLUBILITY IN WATER BY WEIGHT	MELTING POINT ____ °c (____

APPEARANCE AND ODOR

PRESSURIZED?
Yes ☐ No ☐ If Yes, Indicate Pressure ________ mmHg

SECTION IV FIRE AND EXPLOSION HAZARD

FLASH POINT ____ °c (____ °f)	LOWER EXPLOSIVE LIMIT %	UPPER EXPLOSIVE LIMIT %

TEST METHOD
Open Cup ☐ Closed Cup ☐ Cleveland Closed Cup ☐ Other ________

EXTINGUISHING MEDIA	AUTOIGNITION TEMP. ____ °c (____ °f

SPECIAL FIRE FIGHTING PROCEDURES

UNUSUAL FIRE AND EXPLOSION HAZARDS

SECTION V MEDICAL DATA

(Indicate if data is for total product or specific components)

FECTS OF OVEREXPOSURE

ACUTE EFFECTS

	YES	NO
CARCINOGEN		
MUTAGEN		
DAMAGES FETUS		

CHRONIC EFFECTS

:MAL STUDIES - TOXICITY DATA: (Include LD_{50}, LC_{50}, etc.)

DICAL CONDITIONS PRECLUDING EXPOSURE

NIFICANT SYNERGISTIC EFFECTS WITH OTHER CHEMICALS (Specify):

IMUM EXPOSURE REQUIRING MEDICAL EXAMINATION

OSHA ACTION LEVEL

ICAL EXAMINATIONS (Specify Tests and Frequency)

replacement:

eriodic:

ermination:

ost Termination:

nergency Overexposure:

S TO PHYSICIANS

GENCY AND FIRST AID PROCEDURES

RENCES (Attach hard copy of pertinent references and published toxicity data)

CITY INFORMATION SOURCE: Manufacturer ☐ Supplier ☐ IBM ☐

_______________ TITLE _______________ DATE _______________

ANY _______________

ESS _______________

SECTION VI SPILL PROCEDURES AND WASTE DISPOSAL/TREATMENT METHODS

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

WASTE DISPOSAL METHOD

No Special ☐ Secured Hazardous Landfill ☐ Incinerator, Temp. ☐ ______ °C (______ °F)

Landfill ☐ Gov't. Regulations ☐ Other ☐ ______

Specify: ______

WASTE TREATMENT METHOD

No Special ☐ Neutralization ☐ Biodegradeable ☐

Detoxification ☐ Stabilization ☐ Other ☐ ______

NEUTRALIZING CHEMICALS

SECTION VII SPECIAL PROTECTION INFORMATION

SPECIFIC PERSONAL PROTECTIVE EQUIPMENT

RESPIRATORY (Specify in Detail):

PROTECTIVE GLOVES	EYE PROTECTION

OTHER PROTECTIVE EQUIPMENT

VENTILATION REQUIRED?

YES ☐ If Yes, Local Exhaust ☐ Special ☐ ______

NO ☐ Mechanical (General) ☐ Other ☐ ______

SECTION VIII ENVIRONMENTAL MONITORING

RECOMMENDED ENVIRONMENTAL CONTROLS (Limited Access, High Velocity Hood, etc.):

RECOMMENDED ENVIRONMENTAL MONITORING METHODS

	OSHA/NIOSH	EPA	OTHER
EQUIPMENT			
ANALYTICAL METHODS			

RECOMMENDED FREQUENCY OF MONITORING

OSHA/NIOSH	EPA	OTHER

SECTION IX TRANSPORTATION DATA

PROPER SHIPPING (Article) NAME	HAZARD CLASSIFICATION
US/UN HAZARD LABEL	PACKAGE MARKING
TRUCK/RAIL PLACARD	PACKAGE TYPE

PRECAUTIONS TO BE TAKEN IN TRANSPORTATION (e.g., incompatability, prohibited, avoid co-loading with...., etc.):

EMERGENCY ACCIDENT PRECAUTIONS & PROCEDURES

SECTION X REACTIVITY DATA

BILITY

Stable ☐

Unstable ☐

Conditions to Avoid ______

COMPATABILITY (Materials to Avoid - Reaction and/or Toxic Products):

AZARDOUS DECOMPOSITION PRODUCTS

DECOMPOSITION TEMP. ______ °C (______ °F)

AZARDOUS POLYMERIZATION

May Occur ☐

Will Not Occur ☐

Conditions to Avoid ______

SECTION XI SPECIAL PRECAUTIONS

RECAUTIONS TO BE TAKEN IN HANDLING AND STORING

THER PRECAUTIONS

DATA SHEET WAS PREPARED BY (Please Type or Print)

NAME ______

TITLE ______

______
Number Street

______
City State Zip Code

THE INFORMATION HEREIN IS NOT CONSIDERED TO BE CONFIDENTIAL OR PROPRIETARY.

SIGNATURE ______

M MATERIAL IDENTIFICATION NUMBER

IDENTIFICATION OF IBM LOCATION OF CONTROL

DIVISION LOCATION

M CONTACT FOR INFORMATION AND CLARIFICATION

AME ______

DDRESS ______

TLE ______ TELEPHONE ______

GNATURES

AME ______ ______ ______

GNATURE ______ ______ ______

MEDICAL DEPARTMENT | INDUSTRIAL HYGIENE | CHEMICAL COORDINATOR

1. SAFETY MANUAL

Program Element	Performance Criteria	Measurement Tool
policy statement	should clearly state dedication to laboratory health and safety	examine policy
responsibilities	should describe health and safety responsibilities for managers, supervisors, and employees	examine statement and interview managers, supervisors, and employees
site specificity	should be keyed to laboratory facilities and mission	examine for names, evacuati maps, special analyses, etc.
training on manual	manual should be distributed to all employees. Employees should be trained in all elements of manual	interviews with randomly selected employees to determine extent of knowlege abou manual
safety committee	should meet regularly (with documented minutes) to set policies, plan for future needs, resolve problems and complaints, disseminate information, and conduct inspections	inspection of minutes, inter views with members and with other employees. Determination of issues addressed and associated solutions or lack of solutions
chemical control procedures	should detail policies and procedures covering chemicals from the time ordered until disposed - see Section 2	examination of manual
labelling and signs	should detail policies and situations for labelling or otherwise marking hazardous chemicals and situations, safety equipment, etc. - see Section 3	examination of manual
critical event plans	should be prepared for all possible emergency situations - see Section 4	examination of manual
monitoring and surveillance	should detail policies and procedures governing environmental, personal, and medical monitoring and surveillance - see Section 5	examination of manual
pollution control	should detail policies and procedures for determining extent of pollution control required for any analysis - see Section 6	examination of manual
personal protective equipment	should detail policies and procedures for selection and use in the laboratory - Section 7	examination of manual

SAFETY MANUAL (cont.)

Program Element	Performance Criteria	Measurement Tool
containment	should detail policies for determination of when to use and procedures for how to use - see Section 8	examination of manual
training/personnel qualifications	should detail policies and requirements for health and safety training and qualifications for personnel - see Section 6	examination of manual

2. CHEMICAL CONTROL PROCEDURES

Program Element	Performance Criteria	Measurement Tool
procurement	should be reviewed and approved as centralized function	inspection of purchase order records
inventory	should be up to date and include information on amount and location of all chemicals	inspection of printout and verification of accuracy by random selection of chemicals on list and in laboratory
MSDS information	should be readily available for all chemicals. Should have pertinent physical, storage, fire, health, medical, and emergency information	request MSDS information for randomly selected chemicals. Examine for completeness and and accuracy
labelling	all chemicals should have date purchased and opened, purchaser's initials, and special hazards (e.g. flammability, decomposition products, storage requirements, carcinogen, etc.) on the bottle	bottles should be examined in randomly selected laboratories and storage areas
storage procedures	flammables, acids, bases, dry, and radioactive chemicals should be separated, but easily accessible. Gas cylinders should be chained and separated as required	examination of facility and observation of adherence to approved practices
working amounts	no more than one week supply of any hazardous chemical should be stored in any single laboratory	inspection of laboratory and interviews with employees
use	chemicals should be handled according to written procedures including pipetting procedures, transport in containers, etc.	examination of written procedures, interviews with employees, and observation of practices

CHEMICAL CONTROL PROCEDURES (cont.)

Program Element	Performance Criteria	Measurement Tool
waste disposal	should have written procedures detailing types of chemicals, personnel, and procedures. Wastes should be segregated. Approved contractor should be retained	examination of procedures an records. Observation of pra and facilities

3. LABELLING AND SIGNS

Program Element	Performance Criteria	Measurement Tool
chemicals	all chemicals should have date purchased and opened, purchaser's initials, and special hazards (e.g., flammability, decomposition products, storage requirements, carcinogen, etc.) on the bottle	bottles should be examined i randomly selected laborato i and storage areas
samples	should identify potentially hazardous materials using source as toxicity surrogate. Dictates how the sample is to be handled	examination of samples
calibration standards	should identify chemicals and their concentrations	examination of calibration standards
restricted areas	should be clearly designated at all exit and entry points	inspection of facility
hazards	should clearly identify potential electrical, ionizing and non-ionizing radiation, laser, cryogenic, and fire hazards, etc.	inspection of laboratory facility
emergency procedures	should clearly describe exit routes, spill containment procedures, exits, telephone numbers, etc.	inspection of laboratory facility
emergency equipment	should clearly indicate location of fire extinguishers, first aid kits, showers, eye washes, spill containment materials, etc.	inspection of laboratory facility to determine adequa of numbers, types, and locations

4. CRITICAL EVENT PLANS

Program Element	Performance Criteria	Measurement Tool
fire	should include employee notification and evacuation procedures, with scheduled drills. Training in fires and fire fighting. Delegation of responsibilities. Provisions for off-site notification	inspection of written procedures and records plus interviews with employees
chemical spill	should include written delegation of responsibilities, description of procedures, and availability of equipment. Training should be provided to all employees. Provisions for extra-mural coordination should be in place	examination of written procedures and records plus interviews with employees
accidents with personal injury	responsibilities and procedures to be followed should be written and disseminated. Personnel should be trained in CPR/first aid. Arrangements should be made for outside assistance and telephone number posted. Should be reported and tabulated per Agency policy	examination of written procedures and interviews with employees
bomb threat, etc.	should have communication system and written plan for general evacuation or other special (e.g., tornado, flood) measures	examination of written plans and interviews with employees
decontamination	should be written plan for, and have personnel trained in procedures for decontamination of spills, fires, etc. Special equipment and personal protection may be required	examination of training records, employee interviews, and inspection of special equipment
drills	should practice procedures for all critical event plans	inspection of training records and interviews with employees

5. MONITORING AND SURVEILLANCE

Program Element	Performance Criteria	Measurement Tool
inspections	should be conducted on a regular basis to identify problems, initiate solutions, and record close out of a problem through corrective action. Should be conducted by safety committee with annual outside audit. Written report required	examination of written reports and employee interviews

MONITORING AND SURVEILLANCE (cont.)

Program Element	Performance Criteria	Measurement Tool
medical monitoring	should include pre- and post-employment, as well as annual exposure-keyed exams, conducted by competent personnel. Records and administrative requirements should be fulfilled. Should have follow-up on all identified problems	examination of exam protocols and physician qualifications. Interview with physician should be conducted
environmental surveillance	should quantify air, water, and solid waste discharges as needed	examination of policy and procedural documents describing sampling strategy. Examination of sampling records
personal monitoring	should quantify employee exposure to selected chemicals and physical agents on regular basis or as needed. Information should be placed in employee medical file	examination of policy and procedural documents describing sampling strategy. Inspection of sampling records and examination of analytical records to determine appropriateness of sample type and frequency
problem log	safety committee (or other) should maintain record of problems identified, date, corrective action, date corrected, and signature	inspection of log and employee interviews to determine completeness

6. POLLUTION CONTROL

Program Element	Performance Criteria	Measurement Tool
air	exhausts from containment facilities and selected other exhausts are subjected to air cleaning before discharge to the environment	inspection of facility
water	should segregate liquids from containment facility and selected other sources for treatment or special disposal	inspection of facility and employee interviews
hazardous waste	hazardous solids and liquids should be segregated, drummed, and disposed of in approved landfill. Manifest should be maintained	examination of hazardous waste manifest, observation of procedures, and employee interviews. Examination of contract with disposal firm
radioactivity	should comply with all applicable NRC guidelines	examination of records, observation of practices, and interviews with employees

POLLUTION CONTROL (cont.)

Program Element	Performance Criteria	Measurement Tool
biologicals	should not permit even potentially hazardous bacteria, etc. out of laboratory in viable form. Should be autoclaved or incinerated	employee interviews, inspection of facility, and observation of practices

7. PERSONAL PROTECTIVE EQUIPMENT

Program Element	Performance Criteria	Measurement Tool
program	should have organized written system for determination of need for such equipment and its appropriateness, distribution of such equipment, and monitoring of its use	examination documents, employee interviews, and observation of equipment used in several situations to determine appropriateness
respirators	should have written policy covering selection, fit, use, training, etc. in compliance with 29CFR1910.134	examine written policy and other documents, employee interviews and observation, and inspection of respirat[illegible]s
clothing	should have system to determine need for such equipment, evaluate its appropriateness, coordinate its distribution, and oversee its use. Should not be worn outside of the laboratory	examination of written guidelines, employee interviews, and observation of equipment in use to determine its appropriateness
gloves	should have system to determine need for such equipment, evaluate its appropriateness, coordinate its distribution, and oversee its use	examination of written guidelines, employee interviews, and observation of equipment in use to determine its appropriateness
eye protection	should have system to determine need for such equipment, evaluate its appropriateness, coordinate its distribution, and oversee its use. At least glasses should be worn whenever in the laboratory	examination of written guidelines, employee interviews, and observation of equipment in use to determine its appropriateness
special, other	should have system to determine need for such equipment, evaluate its appropirateness, coordinate its distribution, and oversee its use	examination of written guidelines, employee interviews, and observation of equipment in use to determine its appropriateness

8. CONTAINMENT

Program Element	Performance Criteria	Measurement Tool
primary (hood, glovebox)	should be properly constructed, ventilated, and used. Details of use should be specified in SOP. Hoods should be certified by Agency	examination of SOP, inspection of facility, interviews with employees, and observation of practices
secondary (room)	should be negative pressure as compared to rest of facility. Should have separate, one pass HVAC system. See entrance requirements	inspection of facility and measurement of air flow
pollution control	should provide for removal of containment before discharge of air and water from containment facility - see Section 5	inspection of facility and interview with facilities engineer
entrance	should be through an air lock/buffer zone into change room and shower. Should be restricted to authorized personnel, be locked, and have sign-in - sign-out system	inspection of facility and log book. Observation of employee practices
special practices	should have written prodcedures detailing requiremnts for showering, changing clothes, use of personal protective equipment, etc.	examine procedures for adequacy, interview employees, and observe practices
communication	should have visual and audio communication between containment facility and outside areas	inspection of facility and interviews with employees

9. FACILITIES

Program Element	Performance Criteria	Measurement Tool
fire suppression	should have integrated system for fire detection, extinguishing, and notification (of employees and fire department). Should have sufficient inspected hand held extingushers of the proper type	inspection of facility and interview with facilities engineer
HVAC	should be sufficient to provide designated turnovers and maintain desired termperatures. One pass system for laboratories and may recycle for offices	inspection of facility and interview with facilities engineer

FACILITIES (cont.)

Program Element	Performance Criteria	Measurement Tool
laboratory hoods	should be constructed and operated to meet Agency standards. Certification by Agency required	inspection of hoods and certification records. Interviews with employees using hoods and facilities engineer
structural	should be sound and meet all applicable fire, strength, access, etc. codes. Should be well maintained	inspection of facility and interview with facilities engineer
chemical storage	should have centralized facility meeting fire codes. Should separate solids, acids, bases, radioactive, dry chemicals, and wastes. Should have sufficient flammables storage cabinets in individual laboratories	inspection of facility
lighting	should be at levels to meet codes and work needs. Emergency lighting should be sufficient for evacuation	inspection of facility, measurement of light levels, and interviews with employees and facility engineer
emergency facilities/equipment	should have sufficient, well maintained eye washes, showers, etc. Should be inspected regularly	inspection of facility and interviews with employees and facilities engineer
emergency power	should be sufficient to support critical laboratory functions. Should be tested regularly	interview with facilities engineer
housekeeping	should maintain facility (including laboratory equipment) in clean and organized fashion	inspection of facility

10. TRAINING/PERSONNEL QUALIFICATIONS

Program Element	Performance Criteria	Measurement Tool
health and safety orientation	should address subjects of greatest concern to laboratory	review of those presenting, agenda and materials for orientation session. Interviews with employees to gauge effectiveness
health and safety courses	should be in-depth follow-up of the same major topics presented in orientation session	examination of employee and instructor materials related to courses. Interviews with employees to gauge effectiveness

TRAINING/PERSONNEL QUALIFICATIONS (cont.)

Program Element	Performance Criteria	Measurement Tool
courses for designees	should have special training for safety designee, safety committee members, etc. in hazard recognition, industrial hygiene measurement, etc.	examination of course materials and qualifications of course presenters. Interviews with participants to judge effectiveness

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