HETA 99-0252-2831
State of Iowa Division of Narcotics Enforcement
Des Moines, Iowa

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PREFACE

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ACKNOWLEDGMENTS AND AVAILABILITY OF REPORT

This report was prepared by Nancy Clark Burton of HETAB, Division of Surveillance, Hazard Evaluations and Field Studies (DSHEFS). Field assistance was provided by Robert McCleery and Kevin Renton of DSHEFS. Analytical support was provided by Ardith Grote, Division of Applied Research and Technology, and Data Chem Laboratories, Salt Lake City, Utah. Desktop publishing was performed by David Butler. Review and preparation for printing were performed by Penny Arthur.

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Highlights of the NIOSH Health Hazard Evaluation

Evaluation of Drug Evidence Holding Room

In July 1999, NIOSH representatives conducted a health hazard evaluation (HHE) of the narcotics evidence holding room at the State Police Division of Narcotics Enforcement facility in Des Moines, Iowa. The requesters were concerned over employees' exposures to materials stored in the evidence room. There were three reported cancer cases among workers. Several people reported headaches while at the workplace.

What NIOSH Did

- We gathered air samples for volatile organic compounds (VOCs), ethyl ether, acids, and cocaine. We collected wipe samples for cocaine. We tested for fungal growth on two samples of dust from a shelf.
- We measured temperature and relative humidity levels.
- We looked at the ventilation systems and used smoke tubes to see how the air moved.

What NIOSH Found

- We found low levels of VOCs, some of which could have come from the stored chemicals. Low levels of hydrofluoric acid, hydrochloric acid, and sulfuric acid were found.
- Cocaine, ethyl ether, hydrobromic acid, nitric acid, and phosphoric acid were not detected.
- Common fungi (*Eurotium*, *Aspergillus* and *Cladosporium* genera) were detected at low levels in dust samples.
- There was no source of outside air for the evidence room and employee breakroom.
- There was no visible air movement in the evidence room except near the exhaust fan.
- One of the ventilation systems for the front office area was not working.
- There were open areas between the ceiling of the evidence room and the front office ceiling plenum.
- The three cancer cases were of two different types, and their timing did not suggest an occupational origin.

What the Narcotic Enforcement Managers Can Do

- Provide a new HVAC unit for the evidence room with a source of outside air.
- Add a mechanical ventilation system to the breakroom area.
- Develop a preventive maintenance program for the ventilation systems.
- Fix the front office area HVAC unit.
- Seal the walls between the evidence room and ceiling space.
- Clean and organize the room to remove trip hazards.
- Store chemicals in chemical storage cabinets.

What the Narcotic Enforcement Employees Can Do

- Report symptoms to supervisors.
- Seek medical attention if needed.
- Clean and keep evidence room walkways clear of boxes.

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National Institute for Occupational Safety and Health
NIOSH

Health Hazard Evaluation Report 99-0252-2831
State of Iowa Division of Narcotics Enforcement
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SUMMARY

In June 1999, the National Institute for Occupational Safety and Health (NIOSH) received a confidential employee request for a health hazard evaluation (HHE) of the narcotics evidence holding room at the State Police Division of Narcotics Enforcement facility in Des Moines, Iowa. The HHE requesters expressed concern over employees' exposures to materials collected from clandestine methamphetamine laboratories and other drug cases that were stored at the facility. They also reported that there were three recently diagnosed cancer cases among narcotics enforcement staff, and several employees had severe headaches which they associated with the workplace. In response, NIOSH personnel conducted a site visit at the office on July 26 and 27, 1999. Area air samples were collected for volatile organic compounds (VOCs), ethyl ether, inorganic acids, and cocaine in the evidence room and surrounding areas. Wipe samples for cocaine were collected in the evidence room. Two samples of debris were gathered from the shelves and examined for fungal contamination.

The building consists of office space in the front and a back area which contained the evidence room, breakroom, and storage. There were other businesses on both sides of the state police area, separated by fire walls. Low levels of VOCs, including toluene and ethylene glycol, were detected in the evidence room, breakroom area, and the adjacent office. Cocaine was not found in the air or wipe samples. Ethyl ether was not detected in the evidence room or breakroom area. Low levels of hydrofluoric acid, hydrochloric acid, and sulfuric acid (up to 0.11 parts per million [ppm]) were detected in the evidence room, breakroom area, and the adjacent office. Fungi (*Eurotium, Aspergillus,* and *Cladosporium* genera) were detected at low levels on the shelf material collected from the evidence room. There is no provision of outside air to the evidence room or breakroom. Testing indicated no visible air movement in the evidence room except next to the exhaust fan. One of the heating, ventilating, and air-conditioning (HVAC) units serving the front office area was not working at the time of the site visit. There was shared air between the evidence room and the open ceiling plenum, which serves the front office area. A strong organic odor was noted in the evidence room and office areas. The occurrence of a few cases of different types of cancer over a period of years was not suggestive of an occupational origin.

The monitoring data collected during this evaluation indicated that there is a need to improve general ventilation within the building. Recommendations for improving and repairing the general ventilation systems, cleanup of the evidence room, and the addition of chemical storage cabinets are included in the report. The three cancer cases were of two different types, and their timing did not suggest an occupational origin.

Keywords: SIC 9221 (Police Protection), evidence room, clandestine laboratories, narcotics, cocaine, methamphetamine, inorganic acids, volatile organic compounds, ventilation.

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INTRODUCTION

In June 1999, the National Institute for Occupational Safety and Health (NIOSH) received a confidential employee request from employees of the State Police Division of Narcotics Enforcement in Des Moines, Iowa, for a health hazard evaluation (HHE) of the narcotics evidence holding room. The HHE requesters expressed concern over employees' exposures to degrading samples of chemicals, drugs, and plant materials collected from clandestine methamphetamine laboratories and other narcotic cases. They also reported that there were three recently diagnosed cancer cases among narcotics enforcement staff, and several employees had severe headaches while at the workplace. In response, NIOSH personnel conducted a site visit to the office on July 26 and 27, 1999.

BACKGROUND

The evidence storage room is located in a single-story office building with other businesses on either side. There is an office area with open and individual offices in the front half of the building. The back half of the building is open warehouse space. It contains the evidence room, the employee break area, and storage. Two evidence room clerks work in the evidence room as needed, which can be from eight to 40 hours a week. Occasionally, detectives also work in the evidence room. There are eight administrative employees who also work in the building, and field detectives frequently visit the office.

The front office area is served by two package heating, ventilating, and air-conditioning (HVAC) units on the roof. One of these HVAC units was not operating at the time of the site visit. Conditioned air is supplied to the office area through unlined ducts, and some of the air is recirculated from an open ceiling plenum. There are fire walls between the businesses. The walls of the evidence room do not go to the ceiling and there are areas that are open to the ceiling plenum. There is no provision of supply air to the warehouse area that includes the evidence room and employee break area. The evidence room has a ceiling exhaust fan that is controlled by a toggle switch outside the room. The employees keep the evidence room door open when working in the room. One of the evidence room clerks occasionally wears Tyvek™ overalls and rubber gloves to clean the evidence room with a US Environmental Protection Agency (EPA) approved biocide.

At the time of the site visit, the evidence room contained drug evidence from 1983 to date. Evidence can be destroyed by court order after all of the associated legal cases are completed. Some of the more unusual drugs are kept for training purposes. The agency has a contract with the local hospital to destroy the evidence using incineration. In 1998, there were approximately 370 clandestine laboratory investigations conducted by narcotics agents. There are eight individuals on the laboratory team. Personal protective equipment (PPE) used in the field to collect samples include Level A Tychem™ suits, self-contained breathing apparatus (SCBA) respirators, rubber gloves, and shoe covers. During each investigation, the investigators usually collect eight to ten analytical samples in plastic bottles, glass vials, or plastic bags. A hazardous waste disposal company has a contract to remove any remaining substances at the investigation site. After the analyses are completed by the police analytical laboratory, samples are returned to the evidence room for storage. Marijuana is also stored in the evidence room.

METHODS

Qualitative Analysis of Volatile Organic Compounds (VOCs)

To look for volatile organic compounds (VOCs) that might be associated with clandestine drug laboratories, eight area air samples were collected in the evidence room, break room, and office area on thermal desorption tubes containing three beds of sorbent material. The samples were analyzed for VOCs according to NIOSH Method 2549 using a Tekmar thermal desorber interfaced directly to a gas chromatograph and a mass selective detector (TD–GC–MSD).[1]

Ethyl Ether

Five area air samples were collected in the evidence room, break room, and office area for ethyl ether, which is used in illicit phencyclidine (PCP) laboratories. The area air samples were collected at a flowrate of 0.05 liters per minute (L/min) using charcoal tubes and analyzed for ethyl ether according to NIOSH Method 1310 using gas chromatography with a flame ionization detector (GC/FID).[2] For this data set, the analytical limit of detection (LOD) was 0.0005 milligrams (mg), which is equivalent to a minimum detectable concentration (MDC) of 0.007 parts per million (ppm) assuming a sample volume of 22.2 liters. The limit of quantitation (LOQ) was 0.002 mg, which is equivalent to a minimum quantifiable concentration (MQC) of 0.03 ppm, assuming a sample volume of 22.2 liters.

Cocaine Air Samples

Five area air samples for cocaine dust were collected at a flowrate of 2 L/min using 2 micrometer (µm) polytetrafluoroethylene (PTFE) filters. The filters were desorbed in methanol and analyzed for cocaine using GC/FID. Liquid standards were used by the contract analytical laboratory for comparison. The analytical LOD was 0.02 mg, which is equivalent to a MDC of 0.02 ppm, assuming a sample volume of 870 liters. The LOQ was 0.06 mg, which is equivalent to a MQC of 0.07 ppm, assuming a sample volume of 870 liters.

Cocaine Wipe Samples

A new analytical method was attempted to look at possible surface contamination. Seven wipe samples were collected from the shelves and computer work area in the evidence room. Mixed cellulose ester filters (0.8 µm 37 millimeter [mm]) were moistened with methanol and a 10-centimeter by 10-centimeter area was wiped. The filters were transferred to vials in the field. Unexpectedly, at the analytical laboratory, the filters totally dissolved in methanol. The solutions were refrigerated for three days to precipitate out insoluble material. The supernatants were decanted and one-milliliter aliquots from each sample were placed in separate vials. These aliquots were dried, and the resultant solids were dissolved in methylene chloride. These solutions were analyzed for cocaine using GC/FID. Liquid standards were spiked onto filters for comparison. The analytical LOD and LOQ were 0.05 mg/sample and 0.2 mg/sample, respectively. The method had a low recovery level (20%) for the spiked filters, most likely due to the fact that the filters were soluble in methanol.

Inorganic Acids

Five area air samples for acids were collected in the evidence room, break room, and office area at a flowrate of 0.05 L/min using silica gel tubes. The samples were analyzed for hydrofluoric acid, hydrochloric acid, hydrobromic acid, nitric acid, phosphoric acid, and sulfuric acid according to NIOSH Method 7903 using ion chromatography.[3] The analytical MDCs for hydrofluoric acid, hydrochloric acid, hydrobromic acid, nitric acid, phosphoric acid, and sulfuric acid were between 0.004 and 0.09 milligrams per cubic meter (mg/m^3), assuming a sample volume of 22.8 liters. The MQCs were 0.1 to 0.31 mg/m^3, assuming a sample volume of 22.8 liters. Sample concentrations were field-blank corrected.

Indoor Environmental Quality Measurements

Carbon dioxide (CO_2), temperature, and relative humidity (RH) measurements were collected using a Q-Track™ Model 8550 IAQ Monitor. This portable, battery-operated instrument monitors CO_2 through non-dispersive infrared absorption with a range of 0-5000 ppm with a sensitivity of ± 50 ppm. It also directly measures dry bulb temperature (range: 32°F to 122°F) and RH (range: 5% to 95%). Instrument calibration was done prior to use. The CO_2 sensor malfunctioned during the evaluation, so data was only collected for temperature and RH.

Microbial Assessment

Two bulk dust samples were collected from the shelves of the evidence room. The dust samples were submitted for culturable fungal analysis and were processed, extracted, and inoculated on 2% malt extract agar (MEA) and dichloran glycerol (DG-18) media. The plates were incubated at 25°C, and the taxa and rank of the organisms was identified.

EVALUATION CRITERIA

As a guide to the evaluation of the hazards posed by workplace exposures, NIOSH field staff employ environmental evaluation criteria for the assessment of a number of chemical and physical agents. These criteria are intended to suggest levels of exposure to which most workers may be exposed up to 10 hours per day, 40 hours per week for a working lifetime without experiencing adverse health effects. It is, however, important to note that not all workers will be protected from adverse health effects even though their exposures are maintained below these levels. A small percentage may experience adverse health effects because of individual susceptibility, a pre-existing medical condition, and/or a hypersensitivity (allergy). In addition, some hazardous substances may act in combination with other workplace exposures, the general environment, or with medications or personal habits of the worker to produce health effects even if the occupational exposures are controlled at the level set by the criterion. These combined effects are often not considered in the evaluation criteria. Also, some substances are absorbed by direct contact with the skin and mucous membranes, and thus potentially increases the overall exposure. Finally, evaluation criteria may change over the years as new information on the toxic effects of an agent become available.

The primary sources of environmental evaluation criteria for the workplace are: (1) NIOSH Recommended Exposure Limits (RELs),[4] (2) the American Conference of Governmental Industrial Hygienists (ACGIH®) Threshold Limit Values (TLVs®),[5] and (3) the U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits (PELs).[6] Employers are encouraged to follow the OSHA limits, the NIOSH RELs, the ACGIH TLVs, or whichever are the more protective criterion.

OSHA requires an employer to furnish employees a place of employment that is free from recognized hazards that are causing or are likely to cause death or serious physical harm [Occupational Safety and Health Act of 1970, Public Law 95–596, sec. 5.(a)(1)]. Thus, employers should understand that not all hazardous chemicals have specific OSHA exposure limits such as PELs and short-term exposure limits (STELs). An employer is still required by OSHA to protect their employees from hazards, even in the absence of a specific OSHA PEL.

A time-weighted average (TWA) exposure refers to the average airborne concentration of a substance during a normal 8- to 10-hour workday. Some substances have recommended STEL or ceiling values which are intended to supplement the TWA where there are recognized toxic effects from higher exposures over the short-term.

Occupational Exposure to Narcotics and Other Drugs During Law Enforcement Activities

There have been some studies of occupational exposures to drugs and their components during law enforcement activities. The identified routes of exposure for workers were inhalation and skin absorption from collecting, analyzing and packaging/repackaging the drug samples. There are no occupational exposure limits for the drugs that law enforcement officers and evidence room clerks may encounter.

A retrospective cohort study was undertaken of law enforcement chemists (journal subscribers) and clandestine laboratory investigation team members in Washington State.[7] The study had a low response rate (46/270 chemists and 13/23 team investigators). Symptoms reported were headache, and skin, respiratory, and mucous membrane irritation which occurred usually during chemical analysis.

NIOSH conducted HHEs in the mid-1980s to evaluate potential occupational health hazards associated with the seizure of clandestine drug laboratories by the Drug Enforcement Administration (DEA).[8] Five of eight forensic chemists reported headaches when working on clandestine laboratory evaluations. Also four narcotics agents reported headaches when investigating clandestine laboratories in the field. The NIOSH researchers recommended that PPE including chemical protective suits and SCBA be worn for all situations. Training on the hazards associated with the wide range of chemicals that can be found in clandestine laboratories was also stressed. An evaluation of the Hazardous Substances Emergency Events Surveillance (HSEES) system maintained by the Agency for Toxic Substances and Disease Registry (ATSDR) found that from 1996-1999, 112 reported events were associated with methamphetamine (0.5% of total reported).[9] Fifty-three percent of the events resulted in "injuries" to the first responders. Injuries reported included respiratory irritation, eye irritation, nausea and vomiting, dizziness/central nervous system symptoms, shortness of breath, and chemical burns. Police officers were most likely to report these problems. Recommendations included the increased use of PPE, training on the hazards associated with methamphetamine laboratories, and establishing decontamination processes.

One study evaluated exposures to cocaine from handling crime scene evidence.[10] The investigators were responsible for inspecting, fingerprinting, and analyzing the cocaine samples, and reportedly wore latex gloves during this work. Urine samples were collected and analyzed for cocaine and benzoylecgonine (a metabolite). Two investigators had detectable levels of cocaine and benzoylecgonine in their urine after analyzing evidence. These two compounds were not detected in urine samples collected at the beginning of the workday. Laboratory managers, who were used as controls, had no detectable urine concentrations of the two chemicals.

In one instance, three individuals died as a result of phosphine gas exposure while making methamphetamine in a motel room.[11] Officers entered the room without PPE and determined the individuals were dead. Follow-up assistance from a clandestine laboratory task force and a hazardous materials team found levels of phosphine gas greater than 0.3 ppm in the area of the apparatus. This level exceeded the current NIOSH, OSHA, and ACGIH full-shift TWA exposure limits of 0.3 ppm, but not the NIOSH STEL of 1 ppm.

Another investigation looked at exposures to PCP while handling investigative samples.[12] The investigators found that one police department chemist had detectable concentrations of PCP in his/her blood six months after the last known exposure, and another chemist had detectable concentrations of PCP in his/her blood despite the use of a laboratory hood for sample processing. The issue of recreational usage was not addressed.

Chemical Hazards From Drug Storage[13]

There are no published articles that specifically address the storage of drugs and chemicals in evidence rooms. Clandestine laboratories use several different methods to manufacture drugs, therefore, it is difficult to predict the chemical hazards that will be encountered during the initial investigation. Most of the small clandestine laboratories in this part of the country manufacture methamphetamine using the sodium ammonia or "Nazi" method. The "Nazi" formula of methamphetamine production utilizes ephedrine/pseudoephedrine reduction, as well as sodium or lithium metal and other dangerous chemicals such as anhydrous ammonia, hydrochloric acid, sulfuric acid, sodium hydroxide, antifreeze (ethylene glycol), or drain cleaner (sodium hydroxide) in the process. Sodium metal is a fire hazard and will ignite upon contact with water. This production technique has spread throughout the Midwest since anhydrous ammonia is readily available because of its widespread use as an agricultural fertilizer. Another common production method uses red phosphorus instead of anhydrous ammonia. A more detailed list of the potential chemicals that can be used in methamphetamine laboratories and stored in the evidence room is provided in Appendix A.

For cocaine laboratories, potential chemical hazards include allyl benzene, calcium oxide, ethanol, hydrochloric acid, petroleum ether, and sodium metal. For PCP, potential chemical hazards include benzene, ethanol, piperidine, cyclohexanone, ethyl ether, sodium bisulfite, hydrochloric acid, iodine, sodium cyanide, bromobenzene, and magnesium metal.

Ethyl Ether

Ethyl ether is used in illicit PCP manufacturing. It is also used as an anesthetic and as a solvent in the production of dyes, plastics, and rayon. It can cause eye and respiratory irritation. At high concentrations, it can cause central nervous depression, which can include headache, nausea, vomiting, drowsiness, dizziness, and narcosis. Ethyl ether is considered a mild skin irritant. The OSHA PEL and ACGIH TLV for ethyl ether are both 400 ppm as an 8-hr TWA over the workshift.[5,6] ACGIH has also established a STEL of 500 ppm.[5] NIOSH does not have an occupational exposure limit for ethyl ether.[4]

Sulfuric Acid

Sulfuric acid can be used in clandestine methamphetamine laboratories. It is a primary irritant and is corrosive in high concentrations.[14,15] It will cause chemical burns when in contact with the skin and mucous membranes and is particularly hazardous to the eye. Ingestion of sulfuric acid will result in severe throat and stomach destruction.[14] The NIOSH REL, OSHA PEL, and ACGIH TLV for sulfuric acid are all 1 mg/m^3 as a TWA over the workshift.[4,5,6] ACGIH has published a notice of intended change for sulfuric acid of 0.1 mg/m^3.[5]

Hydrochloric Acid

Hydrochloric acid can be used in the production of methamphetamine, cocaine, and PCP. It is an irritant of the eyes, mucous membranes, and skin. NIOSH, OSHA, and ACGIH have all established a 5 ppm ceiling limit for exposure to hydrochloric acid.[4,5,6]

Indoor Environmental Quality

Scientists investigating indoor environmental problems believe that there are multiple factors contributing to building-related occupant complaints.[16,17] Among these factors are imprecisely defined characteristics of HVAC systems, cumulative effects of exposure to low concentrations of multiple chemical pollutants, odors, elevated concentrations of particulate matter, microbiological contamination, and physical factors such as thermal comfort, lighting, and noise.[16,17,18]

With few exceptions, pollutant concentrations observed in the indoor work environment fall well below the NIOSH, OSHA, and ACGIH published occupational standards or recommended exposure limits. The American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) has published recommended building ventilation and thermal comfort guidelines.[19,20] The ACGIH has also developed a manual of guidelines for approaching investigations of building–related symptoms that might be caused by airborne living organisms or their effluents.[21] Measuring ventilation and comfort indicators such as CO_2, temperature, and RH is useful in the early stages of an investigation in providing information relative to the proper functioning and control of HVAC systems.

ASHRAE's most recently published ventilation standard, ASHRAE 62-1999, Ventilation for Acceptable Indoor Air Quality, recommends outdoor air supply rates of 20 cubic feet per minute per person (cfm/person) for office spaces, and 15 cfm/person for reception areas, classrooms, libraries, auditoriums, and corridors.[20] The American National Standards Institute (ANSI)/ASHRAE Standard 55-1992 specifies conditions in which 80% or more of the occupants would be expected to find the environment thermally acceptable.[19] Assuming slow air movement and 50% RH, the operative temperatures recommended by ASHRAE range from 68-74°F in the winter, and from 73-79°F in the summer. The difference between the two is largely due to seasonal clothing selection. ASHRAE also recommends that RH be maintained between 30 and 60% RH.[19] Excessive humidities can support the growth of microorganisms, some of which may be pathogenic or allergenic.

Cancer Clusters

Cancer is a group of different diseases that have the same feature, the uncontrolled growth and spread of abnormal cells. Each different type of cancer may have its own set of causes. Many factors play a role in the development of cancer. The importance of these factors is different for different types of cancer. Most cancers are caused by a combination of factors that interact in ways that are not fully understood. Some of the factors include: (a) personal characteristics such as age, sex, and race, (b) family history of cancer, (c) diet, (d) personal habits such as cigarette smoking and alcohol consumption, (e) the presence of certain medical conditions, (f) exposure to cancer-causing agents in the environment, and (g) exposure to cancer-causing agents in the workplace. In many cases, these factors may act together or in sequence to cause cancer. Although some causes of some types of cancer are known, we don't know everything about the causes of cancer. This can be frustrating to researchers and to people whose lives have been affected by cancer.

Cancers often appear to occur in clusters, which scientists define as an unusual concentration of cancer cases in a defined area or time. A cluster also occurs when the cancers are found among workers of a different age or sex group than is usual. The cases of cancer may have a common cause or may be the coincidental occurrence of unrelated causes. The number of cases may seem high, particularly among the small group of people who have something in common with the cases, such as working in the same building. In many workplaces the number of cases is small. This makes it difficult to detect whether the cases have a common cause, especially when there are no apparent cancer-causing exposures.

When cancer in a workplace is described, it is important to learn whether the reported location of a cancer represent the primary site or a metastasis (spread of the primary cancer into other organs). For occupational cancer investigations, the primary site is used for looking further into specific types of cancer. To assess whether the cancers among employees could be related to occupational exposures, the number of cancer cases, the types of cancer, the likelihood of exposure to potential cancer-causing agents, and the timing of the diagnosis of cancer in relation to the exposure should be considered.

RESULTS/DISCUSSION

Volatile Organic Compounds (VOCs)

All of the air samples contained low levels of similar compounds. The major identified compounds include toluene, siloxanes, heptanes, perchloroethylene, a mixture of C_9-C_{12} aliphatic hydrocarbons and alkyl benzenes, trichloroethylene, methyl propanoic acid esters, ethylene glycol, propylene glycol, butanol, butyl cellosolve, limonene, methanol, 1,1,1,-trichloroethane, and isopropanol. Some of these chemicals have been associated with clandestine laboratories (toluene and ethylene glycol), however, they have other sources and have been found in the air in non-industrial buildings. Others could be substances that were created during the manufacturing process.

Ethyl Ether

The area air sampling results for ethyl ether are shown in Table 1. Ethyl ether was not detected in the area air samples at a MDC of 0.007 ppm.

Cocaine Area Air Samples

The area air sampling results for cocaine are presented in Table 2. Cocaine was not detected in the area air samples at a MDC of 0.02 mg/m^3.

Cocaine Wipe Samples

Cocaine was not detected in any of the seven wipe samples that were collected at a LOQ of 0.05 mg/sample. It is difficult to interpret these data since the analytical method which was used for the first time had a very low recovery rate (20%).

Inorganic Acids

The area air sampling results for inorganic acids are shown in Table 3. Low levels of hydrofluoric acid (up to 0.04 ppm), hydrochloric acid (trace levels), and sulfuric acid (up to 0.11 ppm) were found on the day of the survey. Hydrobromic acid, nitric acid, and phosphoric acid were not detected in the samples at MDCs of 0.004 mg/m^3, 0.004 mg/m^3, and 0.09 mg/m^3, respectively.

Bulk Dust Samples

The fungal species identified from the loose material on the shelves in the evidence room were *Eurotium (Aspergillus) repens*, *Eurotium (Aspergillus) rubrum*, *Aspergillus versicolor*, and *Cladosporium cladosporioides*. Total fungal counts ranged from 1.4×10^3 to 8.2×10^3 colony forming units per gram. The counts of these organisms were low, and all of the fungi are commonly found in indoor environments. The *Eurotium* species are associated with household dust; *Aspergillus versicolor* organisms are associated with wet indoor environments; and *Cladosporium* species are very common in moist outdoor and indoor environments.

Observations

There was a strong odor of organic material in the evidence room and surrounding office areas. Some of the evidence in powder form was stored in heat-sealed plastic bags within manila envelopes. Some of these bags were coming open during storage. The evidence room clerks reported that mice chew holes in the bags of marijuana. A dead mouse was observed during the survey on a shelf. Some of the aisles were blocked, creating a trip hazard.

Smoke tube patterns showed that there was no air movement in the evidence room in the back areas away from the exhaust fan. Some of the individuals who worked in the evidence room reported developing headaches while working in that area. Inside the evidence room and in the break area, the morning temperature was 79°F and the RH was 61%. The outside temperature was 82°F and the RH was 79%. The inside temperature measurement was at the top of the suggested range of 73-79°F in the summer, and the inside RH measurement exceeded the ASHRAE guidelines of relative humidity of 30 and 60% RH.[19]

Cancer

Three cases of cancer were reported during the site visit (one breast and two non-Hodgkins lymphoma). Two of the three individuals worked in the narcotics department for less than two years. The other individual had worked more than ten years as a field investigator.

Cancer is common in the United States, and occurs among people at any workplace. One in two men and one in three women will develop some type of cancer in their lifetime. One of every four deaths in the United States is from cancer. These figures show the unfortunate reality that cancer occurs more often than many people realize. When several cases of cancer occur in a workplace, they may be part of a true cluster when the number is greater than we expect compared to other groups of people similar with regard to age, sex, and race. While comparing the expected number of people with cancer with the observed number is sometimes done to assess whether the occurrence of cancer in a particular group is unusual, such a comparison often is not very informative, particularly in the early phases of a cluster investigation. Cancer rates are very variable in small populations and rarely match the overall rate for a larger area, such as the state, so that for any given time period some groups of people have cancer rates above the overall rate and others have rates below the overall rate. So, even when there is an excess, this may be completely consistent with the expected random variability in cancer rates. Focusing on other aspects of the perceived cluster, as described below, usually is more helpful. These considerations address more directly the possibility of a link between the reported cancers and the work environment.

The time between first exposure to a cancer-causing agent and clinical recognition of the disease is called the latency period. Latency periods vary by cancer type, but usually are 15 to 20 years. In some instances the latency period may be shorter, but it is rarely less than 10 years. Because of this, past exposures are more relevant than current exposures as potential causes of cancers occurring in workers today. Often, these exposures are hard to document.

Cancer clusters thought to be related to a workplace exposure usually consist of the same types of cancer. When several cases of the same type of cancer occur in a workforce, and that type is not common in the general population, it is more likely that an occupational exposure is involved. When the cluster consists of multiple types of cancer, without one type predominating, then an occupational cause of the cluster is less likely.

The relationship between some agents and certain cancers has been well established. For other agents and cancers, there is suspicion but the evidence is not definitive. When a known or suspected cancer-causing agent has been present, and the types of cancer occurring have been linked with these exposures in other settings, the connection between cancer and a workplace exposure is more likely. This was not the case at the Iowa State Police Narcotics Enforcement Facility.

CONCLUSIONS

The ventilation for the evidence room is inadequate. There is no provision of outside air to the evidence room and back warehouse area where the employee breakroom is located, and the smoke tube tests showed no air movement in the back portion of the evidence room. In addition, one of the HVAC units for the front office area was not working at the time of the site visit. Openings near the ceiling of the evidence room resulted in air mixing with the open ceiling plenum, which serves the front office area. Odors from the evidence room were also prevalent in the office areas. No hazardous exposures to chemicals or fungi were found. The reported health symptoms could be related to the odor or the inadequate ventilation. The occurrence of three cases of two different types of cancer over a period of three years, in two cases within two years of starting work, is not suggestive of an occupational origin.

RECOMMENDATIONS

1. Mechanical ventilation should be provided to the warehouse area to provide employees with comfortable working conditions.[19] ASHRAE recommends a minimum of 20 cubic feet per minute per person of outside air.[20]

2. There are no ventilation guidelines specifically for evidence rooms. Based on general laboratory recommendations developed for the use and storage of chemicals, the evidence room should have a dedicated HVAC unit which maintains the room at negative pressure and provides approximately 6 air changes per hour (ACH), a portion of which should be outside air.[22] The air should be exhausted directly to the outside, away from occupied areas. Ideally, the air should be supplied in two locations at either end of the room and exhausted from the center.

3. The HVAC unit for the front office area should be repaired and a comprehensive preventive maintenance program should be developed to ensure that the ventilation systems work properly.

4. The evidence room should be sealed to minimize air mixing between the evidence room and the office areas.

5. The evidence room should be cleaned and organized to eliminate trip hazards from boxes in the walkways.

6. Liquid chemicals should be stored in appropriate commercially available chemical storage cabinets.

7. Employees should continue to report any adverse health symptoms to their supervisors when they occur and seek appropriate medical attention if symptoms persist.

8. All evidence should be appropriately sealed and protected from rodents, in order to avoid surface contamination and potential employee exposures.

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Table 1
Ethyl Ether Area Sampling Results
State Police Division of Narcotics Enforcement
Des Moines, Iowa
HETA 99–0252

Sample Location	Sampling Time	Sample Volume (Liters)	Concentration (ppm)*
Evidence Room - Right Middle Shelf	7:35 a.m. - 3:22 p.m.	23.4	ND**
Evidence Room - Far Left Corner	7:30 a.m. - 3:22 p.m.	23.6	ND
Evidence Room - Computer Work Station	7:26 a.m. - 3:21 p.m.	23.8	ND
Breakroom Table	7:45 a.m. - 3:20 p.m.	22.8	ND
Office by Storage Area	7:56 a.m. - 3:20 p.m.	22.2	ND
NIOSH REL			None
ACGIH TLV			400 ppm
OSHA PEL			400 ppm
Minimum Detectable Concentration (MDC)		22.2	0.007
Minimum Quantifiable Concentration (MQC)		22.2	0.03

* ppm = parts per million
** ND = not detected

Table 2
Cocaine Area Air Sampling Results
State Police Division of Narcotics Enforcement
Des Moines, Iowa
HETA 99–0252

Sample Location	Sampling Time	Sample Volume (Liters)	Concentration (mg/m^3)*
Evidence Room - Right Middle Shelf	7:34 a.m. - 3:15 p.m.	922	ND**
Evidence Room - Far Left Corner	7:30 a.m. - 3:15 p.m.	930	ND
Evidence Room - Computer Work Station	7:26 a.m. - 3:14 p.m.	936	ND
Breakroom Table	7:43 a.m. - 3:12 p.m.	898	ND
Office by Storage Area	7:58 a.m. - 3:13 p.m.	870	ND
Minimum Detectable Concentration (MDC)		870	0.02
Minimum Quantifiable Concentration (MQC)		870	0.07

* mg/m^3 = milligrams per cubic meter
** ND = not detected

Table 3
Inorganic Acids Area Sampling Results — State Police Division of Narcotics Enforcement
Des Moines, Iowa
HETA 99–0252

Sample Location	Sampling Time	Sample Volume (Liters)	Concentration		
			Hydrofluoric Acid (ppm)*	Hydrochloric Acid (ppm)	Sulfuric Acid (mg/m^3)**
Evidence Room - Right Middle Shelf	7:33 a.m. - 3:31 p.m.	23.9	0.02	ND^	ND
Evidence Room - Far Left Corner	7:30 a.m. - 3:31 p.m.	24.1	Trace^^	ND	ND
Evidence Room - Computer Work Station	7:25 a.m. - 3:30 p.m.	24.3	0.04	Trace	0.11
Breakroom Table	7:45 a.m. - 3:29 p.m.	23.2	Trace	ND	ND
Office by Storage Area	7:54 a.m. - 3:29 p.m.	22.8	ND	ND	Trace
NIOSH REL			3	5 (ceiling)	1
ACGIH TLV			3 (ceiling)	5 (ceiling)	1 (0.1)#
OSHA PEL			3	5 (ceiling)	1
Minimum Detectable Concentration (MDC)		22.8	0.005	0.009	0.02
Minimum Quantifiable Concentration (MQC)		22.8	0.02	0.03	0.09

* ppm = parts per million **mg/m^3 = milligrams per cubic meter ^ND = not detected ^^ Trace = between MDC and MQC
# 2001 Notice of Intended Changes

Appendix A

Chemicals Associated with Methamphetamine Laboratories[13]

Acetaldehyde
Acetic Acid
Acetic Anhydride
Barium Sulfate
Benzaldehyde
Benzyl Chloride
Carbon Disulfide
Ethyl Aldehyde
Formamide
Formic Acid
Hydrogen Gas
Hydrogen Iodide
Hydrogen Peroxide
Lithium Aluminum Anhydride
Magnesium Metal
Mercuric Chloride
Methylamine
Palladium metal
Perchloric Acid
Phenylacetic acid
Phenyl-2-propanone
Phosphorus Pentachloride
Pyridine
Sodium Cyanotrihydroborate
Thionyl Chloride

For Information on Other
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Call NIOSH at:
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