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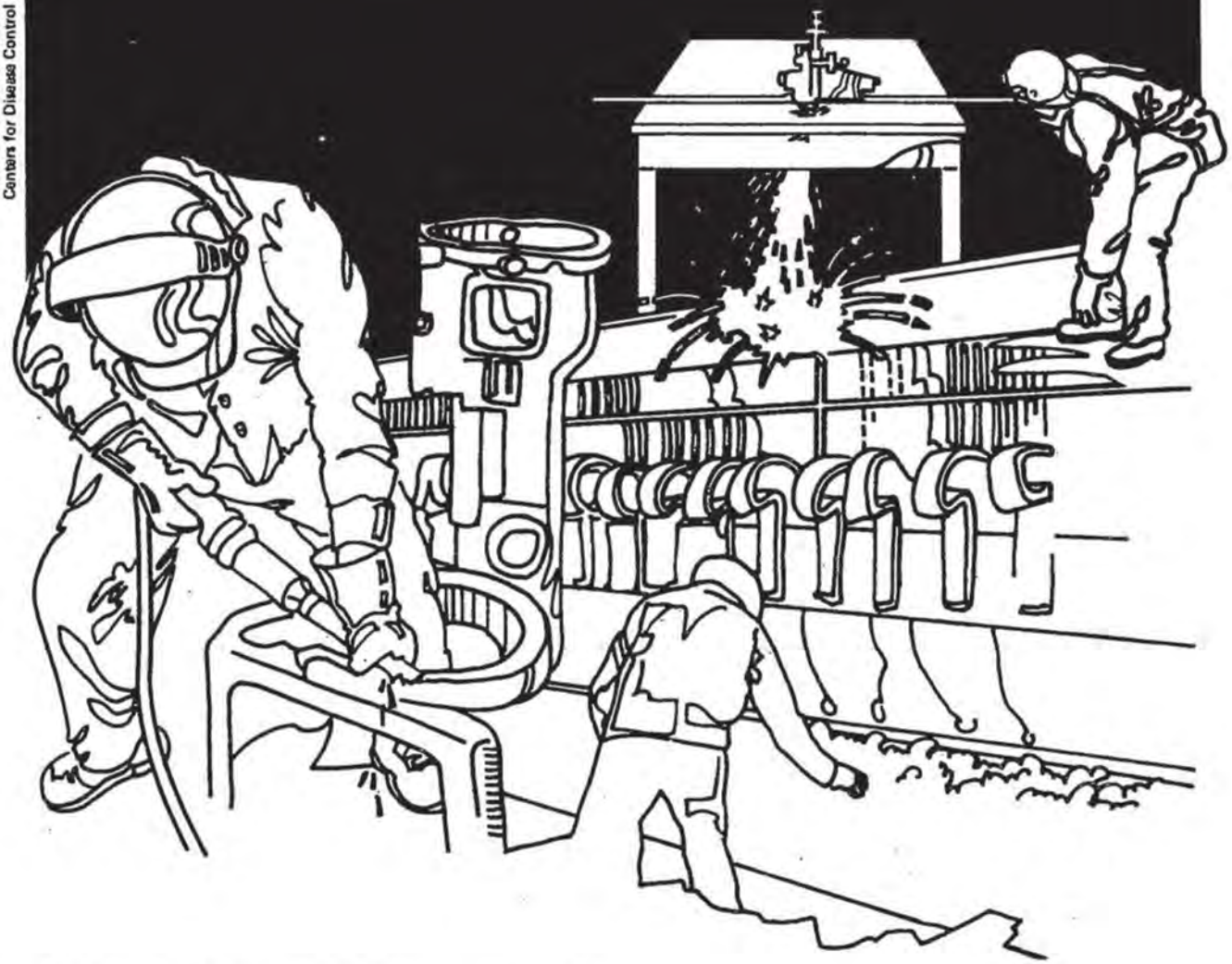
NIOSH



Health Hazard Evaluation Report

HETA 82-134-1197
AFRICAN SWINE FEVER LABORATORY
SANTO DOMINGO, DOMINICAN REPUBLIC

PREFACE

The Hazard Evaluations and Technical Assistance Branch of NIOSH conducts field investigations of possible health hazards in the workplace. These investigations are conducted under the authority of Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6) which authorizes the Secretary of Health and Human Services, following a written request from any employer or authorized representative of employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found.

The Hazard Evaluations and Technical Assistance Branch also provides, upon request, medical, nursing, and industrial hygiene technical and consultative assistance (TA) to Federal, state, and local agencies; labor; industry and other groups or individuals to control occupational health hazards and to prevent related trauma and disease.

HETA 82-134-1197
September 1982
African Swine Fever Laboratory
Santo Domingo, Dominican Republic

NIOSH INVESTIGATORS
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I. SUMMARY

On February 11, 1982, the National Institute for Occupational Safety and Health (NIOSH) received a request from the United States Agency for International Development in Santo Domingo, Dominican Republic, that asked NIOSH to investigate the cause of a series of acute illnesses that had affected 13 of the 22 employees at the Santo Domingo Laboratory of the African Swine Fever (ASF) Eradication Program of the Government of the Dominican Republic.

The NIOSH survey of the ASF Laboratory, which is housed in a converted 9 room residence, was conducted during the week of March 22, 1982. Interviews were conducted with all 17 available employees. A walk-through inspection was conducted and a chemical inventory was prepared. Laboratory procedures and practices were observed. Environmental sampling was conducted to measure exposure to solvents, metals, and airborne particulate contaminants.

The first episode of illness affected 4 lab personnel on July 14, 1981. Five other employees were affected (one or more times) on separate days during September and October, and 4 other employees on November 23. The last reported episode of illness involved one employee on December 29, 1981. The illnesses were characterized by the sudden onset of rapid heart rate, dizziness, severe weakness and in some cases by shortness of breath and/or loss of consciousness. No affected employees experienced nausea or diarrhea during their attacks and their symptoms gradually subsided after several hours.

Twelve of the 13 affected workers worked within the clinical lab (16 employees work within the clinical lab) and 9 (4 July 14, 1 early October, 4 November 23) had the onset of their symptoms while ingesting coffee that had been freshly prepared in the clinical lab. In the July 14 and November 23 episodes, employees in separate parts of the lab almost simultaneously and unknown to each other, suffered the onset of the above mentioned symptoms immediately after ingesting portions of the same batches of coffee. The onset of symptoms in 4 of the 5 employees affected in September and October were not associated with the ingestion of coffee or other food or drink (except for one episode that occurred while the affected person was in the kitchen eating food she had just prepared) and occurred while the affected employees were in the kitchen or the adjacent laundry room.

Neither environmental sampling results for solvents, metals, and airborne particulate contaminates, nor inspection of the laboratory revealed any chemical or biological agent present in the environment that would be responsible for the illnesses of the lab personnel. The circumstances of the episodes that occurred on July 14 and November 23 suggest that some contaminant of the coffee may have caused the illnesses of these employees. The illnesses experienced by the four employees whose symptoms were not associated with coffee ingestion conceivably could have been induced by an interaction between laboratory environmental factors, such as elevated temperature and insufficient ventilation, and employee apprehension. Recommendations are contained in Section VII.

Key Words SIC 8071 Virology Laboratory

II. INTRODUCTION

On February 11, 1982, the United States Department of Agriculture relayed a request from the U. S Agency for International Development in Santo Domingo, Dominican Republic, for assistance from NIOSH. This request asked NIOSH to investigate the cause of a series of illnesses during the previous year that had affected employees at the Santo Domingo Laboratory of the African Swine Fever Eradication Program of the Government of the Dominican Republic. There had been several incidents between July and December 1981 in which employees had become ill with symptoms of rapid heart rate, dizziness and weakness and had been rushed to local hospitals for medical attention. In all instances the employees' symptoms gradually subsided over a several-hour period, but no etiology had been determined. The requestor asked NIOSH to determine whether any substance present in the laboratory environment could be causing these episodes of illness.

The NIOSH survey of the African Swine Fever (ASF) Laboratory was conducted during the week of March 22, 1982. The NIOSH investigators were accompanied by a representative of the United States Department of Agriculture who was sent by that department to assist in the investigation of the illnesses. On March 22 meetings were held with the United States Agricultural Attache in the Dominican Republic, an official of the United States Agency for International Development (USAID), the Deputy Director of the Dominican Government's African Swine Fever Eradication Program and the Director of the ASF Laboratory, to discuss the NIOSH evaluation at the African Swine Fever Lab. A walkthrough inspection of the laboratory was then conducted. Medical interviews and the environmental survey were conducted on March 23 and 24, and preliminary findings were discused with the Laboratory Director on the afternoon of March 24. On March 25, meetings were held with with the United States and Dominican Government Officials mentioned above to discuss the preliminary findings.

III. BACKROUND

The ASF Laboratory was established in 1979 to help combat an epidemic of African swine fever that was affecting the domestic pig population of the Dominican Republic. This laboratory is housed in a converted residence located in the suburbs of Santo Domingo and processes specimens obtained from deceased pigs from throughout the country to determine the presence of ASF virus, other viruses, intestinal parasites, or bacteria pathogenic to pigs. Twenty-one people, employed by the Dominican Government, work at the ASF laboratory, and one advisor from the United States Department of Agriculture works at the lab periodically. Of these twenty-two people (9 male and 13 female), sixteen (4 male and 12 female) work at least occasionally within the clinical portion of the laboratory where the viral cultures and other diagnostic procedures are performed. Entrance to the clinical lab is limited to these 16 employees, who change into laboratory shoes and coveralls before entering the lab and shower before leaving. The six other support employees (a secretary, 2 chauffeurs, and 3 security personnel) work outside the clinical lab and do not enter it.

The African Swine Fever Laboratory is the sole occupant of a single-story poured concrete structure (formerly used as a private residence) that is located on a 50' x 100' lot. This building sits on a concrete slab and is surrounded by a concrete privacy wall 7 feet in height. The clinical laboratory has controlled access with a single outside entrance, and workers are required to pass through a locker room and change into laboratory coveralls before entering. On the ground level, the clinical laboratory has rooms for bacterial culture, viral culture, flourescent microscopy, and pathology, as well as the shower and locker rooms. The former kitchen (also located on the ground floor) is now used to clean, dry and sterilize laboratory glassware and contains drying ovens and an autoclave. The laundry room adjacent to the kitchen contains a clothes washing machine, a clothes dryer (vented to the room) and an apparatus to distill water for laboratory use. A small loft office, 12' x 24', is located above the main work area and is accesible only from within the laboratory. This loft area contains cabinets for storage and several desks used by the lab personnel while writing reports. The office for the laboratory, which is occupied by the laboratory director and the laboratory secretary, is located at the front of the lab building and cannot be reached from inside the clinical lab.

The interior of the laboratory is quite "enclosed" in that the windows in all rooms except the pathology room are closed with opaque shutters, and the window openings are covered with plastic. There is no central air distribution system present in the laboratory. "Through the wall" air conditioning units are the sole source of ventilation for most work areas. Additional ventilation is provided by an open door from the laundry room to the back patio, a wall fan (installed about five months prior to the survey) in the laundry room wall that faces the patio, and a window in the pathology room which is left open to recieve specimens.

Water is obtained from the city water system and is stored in a locked poured-concrete cistern located on the east side of the building. Sewage is disposed of in a cesspool located in the backyard behind (south of) the laboratory. Animal carcasses and combustible laboratory waste material are incinerated in a diesel fuel-fired incinerator in the back courtyard. A diesel-powered auxiliary generator (located at the front of the lab building near the lab office) supplies electricity whenever there are interruptions in electrical service.

IV. EVALUATION DESIGN AND METHODS

A. Medical

The NIOSH physican conducted interviews with all 17 available employees to determine the symptoms of any acute illnesses they may have had while working at the lab and the circumstances surrounding the onset of any symptoms they may have experienced. In addition, the physician who had treated three of the employees who had become acutely ill on November 23, 1981 was interviewed.

B. Environmental Activities

The NIOSH industrial hygienist conducted a walk-through inspection of the exterior and interior of the laboratory and prepared a chemical inventory of substances present in the lab, focusing on quantities of materials in use, and observed the laboratory procedures and practices. Environmental sampling was conducted over two days both inside the laboratory and in the immediately surrounding area outside. Air samples were obtained on both sorbent tubes and filters for laboratory analysis for solvents, metals, and airborne particulate contaminants present in the laboratory. In addition a sample of sugar, reportedly from the same package as the sugar used in the coffee consummed just prior to the onset of their symptoms by the four employees affected by the initial incident of illness, was obtained from the laboratory director and submitted for analysis.

C. Environmental Methods and Materials

Three different types of sampling were conducted to obtain a general profile of chemical contaminants which may have been present in the laboratory atmosphere or in the area immediately surrounding the lab building. Standard solid sorbent tubes (charcoal and silica gel) were used to collect organic vapors associated with reagents present in the lab. Thirty-seven millimeter mixed cellulose ester filters in cassettes were used to collect particulates for the evaluation of metals and characterization of dusts which might be present in the lab.

Air samples were obtained from five locations: the front office, inside of the surrounding security wall directly across from the entrance to the office, the bacteriology lab, the pathology area (where most of the chemicals present were used and stored), and on the cement railing by the patio out in back of the laboratory. The latter sample permitted an additional determination of contaminant levels outside of the lab, should substances appear in the laboratory atmosphere for which there was no apparent source in the building.

Solvent vapors were collected on sorbent tubes using low-flow sampling pumps calibrated to sample at about 200 cubic centimeters of air per minute. Initially five charcoal tubes (three from the pathology area -- one for each of two days and overnight, and two from outdoors) plus a blank were desorbed with carbon disulfide and screened by gas chromatography. The gas chromatograph was equipped with a flame ionization detector and used a 25-meter methyl silicone fused silica capillary column (splitless mode). The analytical limit of detection was 0.01 mg/sample.

The qualitative gas chromatography/mass spectrometry (GC/MS) results permitted selection of analytes to be quantitatively determined on the remaining sorbent tubes. Seven additional charcoal tubes were desorbed with 1 mL of a 2% isobutanol in carbon disulfide solution which had been spiked with 0.1% cumene as an internal standard. A gas chromatograph equipped with a 30-meter DB-1 bonded-phase, fused silica capillary column (split mode) was used for these analyses.

None of the silica gel tubes were analyzed since data from the GC/MS analyses did not indicate the presence of compounds which would be more suitably collected on or analyzed from that sampling medium versus coconut shell charcoal.

Filters from four locations -- the front inside courtyard wall, front office, pathology area, and back patio, were submitted for trace metal analyses along with four blanks. The samples were placed on a hot plate at 150°C with concentrated nitric acid. The residues were dissolved in dilute acid, and the resulting solutions were analyzed by inductively coupled plasma-atomic emission spectroscopy (ICP-AES) for 27 different metals. The lower limit of quantitation was 1.1 microgram (ug) per filter.

Five filters were submitted for particulate analysis to characterize dusts and fibers present in the laboratory. The filter samples included areas inside and outside the lab in the same locations as those obtained for metals. Due to the extremely small size of most of the inorganic particles on the filters and the poor optical properties of the cleared filters, the particulate samples could not be adequately characterized by optical microscopy. As a result, a segment of each filter was removed and prepared for examination by analytical transmission electron microscopy (ATEM) using the NIOSH procedure described in NIOSH Publication 77-204: Review and Evaluation of Analytical Methods for Environmental Studies of Fibrous Particulate Exposures. The filters were also examined by polarized light microscopy (PLM) by immersing a wedge of the filter in a refractive index liquid.

During the analysis of the sugar sample, specific tests were done for the determination of nitrites and pesticides. The analysis for nitrites, a photometric test, was performed according to the 1980 Association of Official Analytical Chemists Method 24.041-24.042. The limit of detection was less than 10 parts per million. The analysis for pesticides was done according to the Environmental Protection Agency's Pesticide Analytical Method, Volume I using a liquid chromatograph equipped with an electron capture detector.

Air flow patterns in the laboratory were studied using standard smoke tube procedures.

V. RESULTS

A. Medical

The first episode of illness affecting lab personnel occurred on July 14, 1981 and the last reported case of illness occurred on December 29, 1981. Twelve (2 male,10 female) of the thirteen people (2 male,11 female) who were affected on at least one occasion were interviewed. The illnesses of these 12 employees were characterized by the sudden onset of rapid heart rate, dizziness, severe weakness, and visual disturbances. Four reported shortness of breath, and 3 suffered loss of consciousness. Six employees reported that their conjunctivae were red and/or their faces were markedly flushed at the onset of their symptoms. Seven affected employees reported that they had a severe headache that lasted for several hours. No affected employees reported nausea or diarrhea during their attacks, and only one felt sleepy during the recovery phase. None noted any unusual odor prior to the onset of symptoms.

The first incident began at approximately 8:30 A.M on July 14, 1981 when four employees (1 male and 3 females) almost simultaneously became ill with the above symptoms immediately after consuming portions of the same batch of coffee. This coffee had been freshly prepared in the laboratory kitchen using the procedure employed on most days: tap water was heated in an aluminum percolator coffee pot with a laboratory Bunsen burner. Only the four affected employees consumed the coffee. It is of note that one of the employees became ill while drinking this coffee in the laboratory's upstairs loft office and he was not aware that three other employees on the main level of the lab were simultaneously becoming ill. These 4 employees were rushed to a local hospital, emesis was induced and their symptoms gradually subsided over several hours. After this incident, samples of coffee and sugar were obtained from the same packages reportedly used on July 14 in preparing the coffee consummed by the four affected individuals. Rats were innoculated by oral administration and by intra-peritoneal injection with solutions prepared from these samples. The animals were observed for the following two days but no abnormal behavior was observed.

No employees experienced symptoms during the remainder of July or August. However, during late September and early October, on separate days, five employees who had not been affected in the July incident (all female), experienced episodes of illness with the same symptoms as described above. One medical technician became ill while she was in the upstairs loft office drinking coffee that had been prepared in the lab kitchen. At the time this employee became ill, another employee (who was not drinking coffee) was also in the loft office but did not become ill. Another medical technician became ill while she was in the kitchen consuming food (but not coffee) that she had just prepared. The remaining three employees' illness episodes (one had one episode, one had 2 episodes, one had 3 episodes) were not associated with the ingestion of any food or drink and these episodes occurred while the affected employees were also in the kitchen or the adjacent laundry room. The symptoms of the illnesses that occurred in September and early October tended to be somewhat milder than the symptoms of the disease that occurred in July, and the affected employees generally recovered more quickly.

After the episodes of illness in late September and October, an equipment maintenance engineer checked all laboratory equipment and the carbon dioxide supply system. All equipment was found to be functioning properly and no leaks were detected in the carbon dioxide system. The engineer's report noted that temperatures in the laundry room had been measured as high as 37° C and recommended that a large fan be installed in that room to help remove the heat and moisture generated by the clothes dryer and distillation apparatus.

On November 23, 1981 four employees (who had not been previously effected) simultaneously became ill with the above described symptoms, while (as in the July occurrence) they were consuming portions of a batch of coffee that had been freshly prepared in the kitchen of the clinical laboratory. The coffee was prepared by an employee who did not prepare the coffee consumed just prior to the July 14 illness episode. As in July only the four affected individuals consumed this coffee. Two women employees became ill while consuming this coffee on the back patio just outside of the laundry room at the back of the laboratory, and the two other employees (1 male, 1 female)

became ill while consuming this coffee in the laboratory office, which is located at the front portion of the laboratory. Neither pair of employees was aware of the illness that was occurring in the other pair. The physician that treated three of the employees who became ill on November 23 (the fourth employee was less severely affected and did not seek medical attention) reported that all three were very weak, had pale skin, systolic blood pressures of about 70 millimeters of mercury, pulse rates greater than 140 beats per minute, and pupils that were round, regular, of normal size, and reacted normally to light. This physican also reported that one of his employees who had inadvertantly consumed a sample of the coffee that had been taken by the 4 affected employees just prior to the onset of their symptoms, had experienced similar acute symptoms.

The last reported illness episode occurred on Dec. 29 when an employee, who had experienced symptoms on 3 previous occasions during September and October while she was in the kitchen or laundry room, again experienced symptoms while she was working in those rooms. Her symptoms were not associated with the ingestion of food or beverage and were similar to the symptoms of her previous episodes with rapid heart rate, dizziness and weakness. She recovered within several hours.

Of the thirteen individuals who have experienced symptoms, twelve worked in the clinical lab and 9 (4 on July 14, 1 in early November, 4 on November 23) had the onset of their symptoms while ingesting coffee that had been freshly prepared in the clinical lab. The laboratory secretary, who was the only one of the six support employees who does not work in the clinical lab to be affected, was one of the four people affected on November 23. She experienced the onset of symptoms while she was in the lab office drinking coffee that had been prepared in the kitchen of the clinical lab.

B. Environmental

The majority of chemical substances present in the laboratory are stored in the pathology and microbiology rooms. The microbiology storage area contained a large variety of culture media preparations and supplements, small bottles of methyl alcohol, propyl alcohol, hydrogen peroxide, glacial acetic acid and hydrochloric acid. Phenol and various stains were also present.

The pathology area contained the largest chemical storage area. Liquid chemicals present were methyl, ethyl, propyl alcohols and xylol, diethanolamine, ammonia, glacial acetic acid, hydrochloric acid, formaldehyde, and acetone. Numerous sodium, potassium, and magnesium salts, as well as a variety of stains, were present. Powdered salts were present in 1-pound and 1/4-pound containers, stains in 25-and 5-gram bottles, and liquid compounds in 2-and 4-liter containers with the exception of xylol, which was obtained in a 50-kg. container. Other compounds present included mercury chloride, ammonium sulfate, chloroform, mercurous oxide, glycerine, Permount, parafilm, sodium azide, and sodium barbitol.

Two gases are used by the laboratory: carbon dioxide for providing anaerobic conditions in the virology incubator and propane for the bunsen burners and kitchen oven. All gas cylinders and regulators are located outside the back of the building. The only venting of CO_2 inside the building reportedly occurs when the incubator doors are opened.

None of the environmental samples collected contained any unusual or unexpected contaminants. Most chemical contaminants were present in negligible amounts, with many reported as at or below the analytical limits of detection.

Chromatograms for all five charcoal tube samples were the same; therefore, only the sample containing the highest concentration of contaminants relative to the others was further analyzed by gas chromatography/mass spectroscopy (GC/MS). The only compounds identified by CG/MS as being present on the samples were ethanol, acetone, isopropanol, and xylene. See Table I.

The metals which could be determined by inductively coupled plasma-atomic emission spectroscopy (ICP-AES) (along with their elemental notation) are listed in Table II. As, Be, Cd, Co, Cr, Cu, Li, Mn, Ni, Pb, Pt, Ti, Y, and Zr were all below the 1.1 ug per filter detection limit (essentially less than 1 ug/m^3). Levels of Al, Ca, Fe, Mg, Mo, Na, P, Se, Sn, Te, Tl, V, and Zn were generally at or below the detection limit. The sample obtained inside the security wall across from the entrance to the front office was the only one having all metals except Zn present at concentrations at or above the limit of detection. The highest value was 9.4 ug of Ca which equalled an atmospheric concentration of 9 ug/m^3. This sample location was closest to the gravel road (and its vehicular traffic) located on the north side of the lab.

Particulate analysis of filters collected inside and outside the lab did not result in the identification of fibers or particles uncommon to the local environment. No quantification of particulate materials present on the filters was made other than a qualitative assessment concerning the relative abundance of a particular substance. Many of the inorganic particles were too small to be characterized by polarized light microscopy (PLM), however, chemical composition of particles was obtained from analytical transmission electron microscopy (ATEM). (Note that positive identification could not be made for every type of particulate.) No mineral or asbestos fibers were observed on any of the filters. Materials identified on the filters were the minerals associated with calcite clays, feldspars, gypsum, quartz and pyroxene. Unidentified sooty organic particles and arrowroot starch were found on some of the filters. Table III presents the elements and associated minerals identified on the various filters.

Results of the sugar analyses for contaminants were negative. No nitrites, pesticides or other chemical residues were detected in the sugar sample.

Observation of "smoke plumes" generated with the smoke tubes in various areas of the laboratory and connecting hallways did not reveal any distinct airflow patterns from one area to another. Except for air currents generated directly by air conditioner discharges, air circulation was minimal in the laboratory. During the survey the barometric pressure was measured at 773 to 776 millimeters of mercury, daytime dry bulb temperatures were between 25 and 31°C, and the relative humidity was about 48%.

C. Discussion of Environmental Results

The chemical inventory revealed only a small number of substances that were capable of producing airborne contamination in the laboratory. The solvents and other chemical substances in use by the laboratory personnel were generally used in very limited quantities (less that 0.5 liters). The carbon dioxide gas was kept in a cylinder (unsecured to the wall and unshaded from the sun) outside at the back of the laboratory. If carbon dioxide were inhaled in high concentrations (70,000 to 100,000 ppm), it could conceivably produce the symptoms experienced by the laboratory personnel. However, it is most unlikely that carbon dioxide was the source of these employees' symptomatology since: (1) No problems were identified with the use of the laboratory's carbon dioxide supply system during either the equipment maintanance engineer's or the NIOSH inspections, (2) The purchase records do not indicate that large amounts of the gas were used during July or November when the majority of the employees were affected, (3) There is no central air conditioning system, or other mechanism that could distribute the carbon dioxide gas to the upstairs loft office or to the office located in the front of the laboratory (places where personnel experienced the onset of symptoms).

The results of the environmental sampling for airborne contaminants did not reveal any excessive chemical exposures or other health hazards. Although no one sampling medium is suited to collect all contaminants, the approach taken permitted screening for a large number of organic and inorganic substances.

Gas chromatography and mass spectroscopy permitted the separation and identification of organic vapors present in the lab. The only peaks identified from tubes deliberately oversampled (to permit greater sensitivity during qualitative analysis) were ethanol, acetone, isopropanol and xylene.

Break-through on several of the samples for organic vapors is considered to have occurred. In those instances the values presented in Table I should be considered to represent a minimum concentration. Considering that the levels documented were very low (ranging from 50 to 100 times lower than the recommended exposure limits) even samples with break-through are not considered to document a hazard. Additionally, the effects of organics present on the air samples (ethanol, acetone, isopropanol, and xylene) are not similar to those experienced by the affected employees.

Although no contaminants were identified in the sugar, this does not preclude the possibility that some agent may have been present in the sugar at the time of the incident. However, such an agent, if present, would have to have been highly volatile to have left no residual material detectable by chemical analyses of the sugar.

The average relative humidity (48%) falls within the general comfort range of 20 to 60%.[2] The dry bulb temperatures (range of 25 to 31°C) are slighlty above the range of comfortable temperature for normally clothed North Americans (22 to 25°C), but individuals acclimated to a tropical climate might not find a higher temperature range uncomfortable. It is unlikely however, that such individuals would find temperatures as high as 37°C (temperatures reported to have existed in the laundry room prior to the installation of the wall fan) to be comfortable.

V1. SUMMARY AND CONCLUSION

Inspection of the laboratory, observation of work practices, inquiry into the laboratory procedures for using chemical agents, and review of the limited amounts and categories of chemical agents used in the lab, did not suggest that any chemical or biological agent present in the environment would cause the illnesses of the laboratory personnel. Environmental sampling to detect chemicals in and around the work area did not identify any unusual or unexpected contaminants. Most of the levels for chemical contaminants were negligible, with many reported as at or below the analytical limits of detection. The possibility that chemical compounds used in the laboratory environment caused the reported incidences of illness among laboratory personnel does not appear likely based on the results of the industrial hygiene evaluation.

Although no likely sources of chemical contamination were identified in the lab, there were possible sources of employee discomfort present in the laundry room and kitchen. Both rooms contained appliances that produced a high heat and humidity load (ovens and autoclave in the kitchen and a clothes dryer vented to room and a water distillation apparatus in the laundry room). During 1981 the laundry room was ventilated only by open doors to the kitchen and to the back patio. The kitchen was ventilated by a "through the wall" air conditioning unit, but it is possible that during the "warm season" (May-October) this unit would be inadaquate to maintain comfort when the heat producing equipment was in use. (Several employees mentioned that during the previous year the air in the clinical laboratory was frequently oppressive, and that they often had experienced excessive fatigue during their work shifts. However the problems of oppressive air and excessive fatigue had been partially alleviated after a large fan was installed in the laundry room several months prior to our visit.)

In total 13 laboratory employees experienced at least one episode of the illness characterized by dizziness, rapid heart rate and weakness . Nine individuals (all of whom were affected only one time) experienced their symptoms imediately after ingesting freshly prepared coffee. The onset of symptoms in the 4 other affected individuals was not associated with the ingestion of coffee and occurred when these individuals were in the laundry room and kitchen. While the symptoms reported by all of the 13 affected individuals were quite similar it is possible that the etiology of the illness of the 9 individuals with coffee associated symptom onset differs from the cause of the illness in the 4 individuals whose symptom onset was not related to the ingestion of coffee.

In the July and November episodes people in separate parts of the lab almost simultaneously suffered the onset of identical symptoms immediately after ingesting portions of the same batches of coffee. They had no knowledge of the concomitant illnesses occurring in the other affected employees. These circumstances suggest that some contaminent in the coffee may have induced the illnesses of these employees.

It is not clear what substance could bring on such symptoms so rapidly. Consultation with officials of the Food and Drug Administration and a toxicologist specializing in plant toxicology revealed that they had never encountered reports of such symptoms following the ingestion of coffee, but they could not rule out the possibility that contamination with some pesticide or fungus could produce these symptoms. However, the lack of reports of other episodes of similar illness occurring in the community makes the possibility of naturally occurring contamination of the coffee or sugar unlikley. The symptoms and the rapidity of their onset could have been caused by some compound with strong and immediate vasodilating effects such as amyl nitrate but this drug has poor water solubility and thus would not mix well with coffee. No evidence was found to suggest how the coffee prepared on July 14 and November 23, could have become contaminated but contamination of the coffee in some manner, either by accident or intent, must be considered as a possible cause for the series of illnesses associated with coffee consumption experienced by the laboratory personnel.

The etiolology of the non-coffee associated illnesses is less clear. However there have been numerous reports of illness outbreaks (characterized by the symptoms of rapid heart rate, dizziness, and weakness; and accompanied by dyspnea and/or loss of consciousness) that have affected people while they were working in buildings or factories. Since 1974 NIOSH has investigated more than 8 such incidents. In many of the reported cases thorough industrial hygiene evalulations of the facilities have found no specific chemical or biological cause for the disease outbreaks. In several however, there has been some other condition that may have contributed to the appearance of symptoms: employee management tensions, insufficient ventilation, an unusual odor, a previous occurrence of illness caused by environmental factors, or a perception (accurate or not) of a hazardous work environment. It has been postulated that such conditions may interact to induce the development of the above symptoms in employees.[3] Thus it is possible that an interaction among several such factors was associated with the illnesses of the 4 employees who became ill while they were in the kitchen or laundry room and whose illnesses were not associated with coffee ingestion. The illness episode that had occurred on July 14 could have heightened the employees' awareness that there might be something in the lab environment that could cause illness. This apprehension combined with the enclosed lab environment (the tightly shuttered windows covered with plastic) and the high humidity and elevated temperatures commonly present in the laundry room and kitchen conceivably could have induced the symptoms experienced by those four employees.

V11. RECOMENDATIONS

1. Should the employees at the laboratory experience additional episodes of the illness that are associated with the recent ingestion of food or liquid, samples of the exact items consumed should be obtained. It would also be advisable to collect samples of blood, urine and (if available) vomitus, from the affected employes. These food and body fluid specimens should be submitted for toxicological analysis to a Dominican laboratory that is skilled in such analysis. If it is desired, NIOSH can also have such specimens analyzed in the United States. Unfortunately, during the time that is required to transport the specimens to the United States, any substances of interest that may be present in the specimens could be metabolized or modified so that they can not be detected.

2. The practice of eating food and beverages in the work areas of the clinical lab should be discontinued since there is the ever present chance of chemical, bacterial or viral contamination of the food or beverage.

3. It would be advisable to decrease the amount of humidity and heat that may enter the laboratory from the laundry room; therefore the clothes dryer should be vented directly to the outside and additional ventilation should be installed in the laundry room.

4. As a safety measure, the CO_2 cylinder should be secured to the rear wall to decrease the chance of this cylinder falling. (If a compressed gas cylinder falls there is a chance that the cylinder valve will be knocked off and that the cylinder could become an "unguided missle"). Also the cylinder of compressed CO_2 should be shaded from direct sunlight to reduce the cyclic stressing of this pressurized container caused by alternate solar heating and radiant cooling.

V111. REFERENCES

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X. DISTRIBUTION AND AVAILABILITY OF REPORT

Copies of this report are currently available upon request from NIOSH, Division of Standards Development and Technology Transfer, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days, the report will be available through the National Technical Information Service (NTIS), 5285 Port Royal, Springfield, Virginia 22161. Information regarding its availability through NTIS can be obtained from NIOSH Publications Office at the Cincinnati address. Copies of this report have been sent to:

1. United States Agency for International Development (USAID)
2. United States Department of Agriculture (USDA)
3. NIOSH Region II
4. CDC International Office

T .E I

ENVIRONMENTAL CONCENTRATIONS OF SOLVENT VAPORS IN THE
AFRICAN SWINE FEVER LABORATORY
SANTO DOMINGO, DOMINICAN REPUBLIC
HETA 82-134

March 23-24, 1982

SAMPLE DESCRIPTION				CONCENTRATION IN mg/m^3			
DATE	LOCATION	DURATION	VOLUME	ETHANOL	ACETONE	ISOPROPANOL	XYLENE
3/23	Front Office	263 min.	51.6 L	< 0.19	< 0.19	< 0.19	< 0.19
3/23	Pathology Area	237 min.	43.4 L	5.0	3.2	2.3	3.9
3/23	Bacteriology Lab	209 min.	39.6 L	1.8	0.76	1.0	1.3
3/23-4	Pathology Lab (overnight)	1047 min.	187 L	> 7.1	> 12	> 13	7.7
3/24	Front Office	330 min.	65.2 L	< 0.15	< 0.15	< 0.15	< 0.15
3/24	Bacteriology Lab	349 min.	68.4 L	> 8.6	> 8.9	11	2.2
3/24	Pathology Area	337 min.	61.9 L	> 13	> 14	15	3.6
Recommended Occupational Exposure Limits**				1900	1780	980	435
Analytical Limit of Detection				0.01	0.01	0.01	0.01

* All concentrations are given in milligrams per cubic meter (mg/m^3). Less than signs (<) indicate that concentrations for the specified compound were below the given environmental limit of detection. Greater than signs (>) should be considered minimal values for the indicated substance due to break-through on sorbent tubes associated with large sample volumes. The actual values would not be expected to approach the given exposure limits.

** Exposure limits for ethanol and acetone are those recommended by the American Conference of Governmental Industrial Hygienists for an eight hour work shift. The recommended exposure limits for isopropanol and xylene are NIOSH recommended occupational exposure limits for up to a 10 hour work shift, 40 hour work week.

TABLE II

METALS ANALYZED FOR BY INDUCTIVELY COUPLED PLASMA-
ATOMIC EMISSION SPECTROSCOPY
AFRICAN SWINE FEVER LABORATORY
SANTO DOMINGO, DOMINICAN REPUBLIC
HETA 82-134

March 23-24, 1982

Aluminum (Al)
Arsenic (As)
Beryllium (Be)
Calcium (Ca)
Cadmium (Cd)
Cobalt (Co)
Copper (Cu)
Chromium (Cr)
Iron (Fe)
Lithium (Li)
Magnesium (Mg)
Manganese (Mn)
Molybdenum (Mo)
Nickel (Ni)
Lead (Pb)
Phosphorus (P)
Platimum (Pt)
Selenium (Se)
Sodium (Na)
Tellurium (Te)
Thallium (Tl)
Tin (Sn)
Titanium (Ti)
Vanadium (V)
Yttrium (Y)
Zinc (Zn)
Zirconium (Zr)

TABLE III

CHARACTERIZATION OF AIRBORNE PARTICULATES BY
ANALYTICAL TRANSMISSION ELECTRON MICROSCOPY AND POLARIZED LIGHT MICROSCOPY
AFRICAN SWINE FEVER LABORATORY
SANTO DOMINGO, DOMINICAN REPUBLIC
HETA 82-134

March 23-24, 1982

Area	Sample Description* Time	Volume	Major Phases**	Minor Phases	Trace Phases
Pathology Area	355	1323	Ca -- Calcite Si -- Quartz Opaque Sooty Particles	Al,Si -- Clays Al,Si,Ca,Fe	--
Back Patio	306	1178	Al,Si,Ca,Fe -- Feldspars Ca -- Calcite	Mg,Si,Ca,Fe--Pyroxene Ca,S -- Gypsum Sooty Organic Particles	Si,Ca Fe Al,Si,Ca,Mn,Fe P,S,K,Ca
Front Courtyard	377	1230	Ca -- Calcite Al,Si,Ca,Fe--Feldspars	Sooty Organic Particles (unident.) Al,Si,Fe	Al,Si Ca,S -- Gypsum Si,Ca Si,Ti
Front Office	330	957	Ca -- Calcite Al,Si,Ca,Fe--Feldspars	Si,Ca,Fe Al,Si,Fe Si -- Quartz Mg,Al,Si,Fe	Fe Sooty Organic Particles
Hotel Room	527	2055	Ca -- Calcite Al,Si,K,Fe	Al,Si,Ca,Fe--Feldspars Ca,S Arrowroot Starch Cellulose and Cotton Fibers	Ca,P Mg Mg,Si
Hotel Room	405	1620	Ca -- Calcite Arrowroot Starch	Si -- Quartz Al,Si -- Clays Ca,S -- Gypsum Opaque Sooty Particles	Al,Si,Ti
	Blank		None	Clean Filter	
	Blank		None	Clean Filter	

* Time is given in minutes, volume in liters.
** Major Phase: substances constituting more than 20% of the particles present on the filter.
Minor Phase: substances constituting more than 5% but less than 20% of the particles present on the filter
Trace Phase: substances constituting less than 5% of the particles present on the filter.

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