CHAPTER 2

LABORATORY SAFETY

2.1 GENERAL INFORMATION

Aflatoxin testing requires the use of flammable liquids and suspected carcinogens. The building owner (private or GSA) must permit the use of methanol in space used by FGIS. FGIS will provide testing services onsite only in facilities that provide adequate protection to FGIS personnel. The following space requirements apply to FGIS occupied space only.

2.2 APPROVED FGIS LABORATORY SPACE

Individual elevators may provide two kinds of space for personnel to perform onsite aflatoxin testing. The space may be located (1) in a building along with other occupants or (2) in a building devoted exclusively to laboratory space.

In either case, the plan for the intended laboratory space is subject to inspection and approval by FGIS prior to construction. The Safety and Health Office, Equipment Branch, and field office manager will review proposed plans and suggest ways to comply with the requirements.

The following are minimum requirements for laboratory space:

a. Location.

Locate the laboratory at least 100 feet from the base of the elevator headhouse. This distance is subject to negotiation when the elevator uses exterior grain legs and/or inclined belts in lieu of interior grain legs or where the headhouse is equipped with blow-out panels or the headhouse consists of a lightly covered framework.

Laboratories must meet the following requirements when they are located in a building with other occupants.

(1) Isolate the laboratory from nonlaboratory occupants using a fire barrier having at least a 1-hour fire resistance.

(2) Provide a fire barrier consisting of floors, ceilings, and interior walls.

(3) Provide all passageways and other openings that lead to adjacent interior space with self-closing fire doors having a 1-hour fire resistance. Do not block these doors open.

(4) Separate the space from central heating, ventilation, and air-conditioning using automatic-closing fire dampers in the heating, ventilation, and air-conditioning ducts near the fire barrier, or provide a separate heating, ventilation, and air-conditioning system for the laboratory.

b. Size.

Dedicate the space strictly for laboratory (chemical) work. Supply adequate space for chemical analysis (minimum of 100 square feet) and a separate area for sample preparation and grinding purposes. Samples must be ground in space separate from the analytical space.

c. Electrical System.

Provide the laboratory space with electrical power and lighting meeting the standards of the National Electrical Code. Wiring suitable for a Class I location is not required. A three-wire system consisting of an energized wire, a neutral wire, and a grounding conductor is satisfactory.

Install overhead lighting fixtures through ceilings that serve as fire barriers. Fixtures suspended below such ceilings are acceptable.

d. Exhaust System.

The exhaust system must remove methanol vapors from the work area. Normal air conditioning and heating may provide adequate ventilation when performing testing procedures in a building devoted exclusively for laboratory space. The local Collateral Duty Safety and Health Officer and the Safety and Health Office in Washington, DC, will assist in assessing on a case-by-case basis whether added ventilation, such as a fume hood, is needed. If needed, situate the laboratory space so that hoods, to be supplied by FGIS, are vented to the exterior of the building. Fume hood ventilation will require a 6 or 8 inch diameter opening either vertically through the ceiling and roof or horizontally through an exterior wall. In some cases, a portable hood may be sufficient.

e. Plumbing.

Provide the laboratory space with a basin having hot and cold potable water and a sewer connection.

For further information about these requirements, contact the FGIS Safety and Health Staff.

f. Eyewash and Safety Shower Station.

Provide the laboratory space with eyewash equipment (eyewash bottle or permanent faucet-mounted fixture). A permanent, faucet-mounted eyewash fixture is highly recommended. A safety shower station must be installed in laboratories where acetonitrile-based extraction solvent (Romer-Fluoroquant test method) is used.

2.3 FGIS LABORATORY PRACTICES

When working in a laboratory, FGIS employees must comply with the Chemical Hygiene Plan developed for the laboratory where the testing is performed. To accomplish this, include the following as part of an overall FGIS laboratory "Standard Operating Procedure" (SOP). Maintain the SOP, this handbook, and the current Material Safety Data Sheets (MSDS) and Chemical Hygiene Plan at each laboratory.

a. Label all bottles and containers according to the Hazard Communication Program. In addition, when preparing mixtures of solutions, securely apply a label with the name of the solution, the preparation date, and the preparer's initials written in permanent ink.

b. Do not smoke, eat, drink, or chew gum or tobacco in the laboratory.

c. Wash hands immediately before and after eating, drinking, and smoking outside of the laboratory area.

d. Wear a disposable, fire-retardant laboratory coat and disposable impermeable gloves when working.

e. Clean the laboratory equipment and dispose of contaminated materials according to procedures listed in this chapter.

f. Wear an FGIS-approved disposable mask and hair protection when grinding samples, or when otherwise exposed to airborne grain dust.

g. Do not wear contact lenses in the laboratory if the testing process involves chemicals other than methanol (e.g., acetonitrile).

h. Wear FGIS-approved safety glasses or splash goggles when in the lab (also applies to visitors in the lab).

i. Do not store food or drink in the laboratory refrigerator. Store only the test kits and other items requiring refrigeration.

j. Do not wear protective clothing outside the laboratory unless waste chemicals are being removed to outside storage facilities or extra chemicals are being carried into the laboratory from an outside storage cabinet.

k. Do not store masks and hair protectors in the grinding area where they might become contaminated by the dust particles.

2.4 STORING CHEMICALS AND SOLVENTS

a. Store chemicals and equipment outside the fume hood.

b. Store chemicals in places where they will not clutter bench tops or obstruct movements. Do not store solutions at a height exceeding eye level. Large bottles shall be stored no more than two feet above ground level.

c. Prepare all solutions and perform analyses in a working fume hood.

d. Limit the total quantity of waste chemicals in the laboratory to 1 liquid gallon.

e. Maintain a current MSDS for each chemical at the laboratory. If each supply of chemicals received does not have a MSDS enclosed, contact the company and request one immediately.

f. Limit the total amount of flammable solvent in the laboratory to 2 gallons.

g. Store flammable solvents in an approved solvent storage cabinet.

2.5 CLEANING LABWARE

a. Negative Tests (# 20 ppb).

(1) Labware.

Prepare a solution consisting of dishwashing liquid and water. Completely submerge the used glassware, funnels, beakers, etc., wash thoroughly, then rinse with clean water before reusing.

(2) Disposable Materials.

Place materials in a garbage bag for routine trash disposal.

b. Positive Tests (> 20 ppb).

(1) Labware.

Prepare a bleach solution consisting of 1 part bleach to 10 parts water (e.g., 100 ml bleach to 1,000 ml water). Completely submerge the used glassware, funnels, beakers, etc., and soak for at least 5 minutes. Remove items from the bleach/water solution, submerge in a dishwashing liquid/water solution, wash thoroughly, then rinse with clean water before reusing.

(2) Disposable Materials.

Prepare a bleach solution consisting of 1 part bleach to 10 parts water in a plastic pail labeled "bleach solution". Soak disposable materials, such as used columns, cuvettes, vials, test kit components, etc., for at least 5 minutes. Pour off the liquid down the drain and place the materials in a garbage bag and discard.

2.6 CLEANING AFLATOXIN SOLUTION SPILLS

Perform the following procedures only while wearing disposable impermeable gloves and chemical splash goggles. If hands become contaminated, wash immediately with undiluted bleach followed by soap and water.

Clean areas and materials contaminated by any aflatoxin solution or positive (i.e., > 20 ppb) extraction solutions spills with bleach. The affected area should be completely covered with 5-6 percent sodium hypochlorite (household bleach) dispensed from a plastic wash bottle or spray bottle. Apply 10 parts of bleach to 1 part of spilled material and leave for at least 5 minutes. Wipe up the bleach using an absorbent cloth or paper towels. Place cleaning materials in a plastic waste bag, close tightly, and discard.

2.7 DISPOSING EXCESS SAMPLE EXTRACT

a. Negative Samples (# 20 ppb).

Dispose of the excess sample extract solution in an approved waste container. Place the sample slurry in a garbage bag for routine disposal.

b. Positive Samples (>20 ppb).

The sample extract and slurry left over after completion of the test procedure must be decontaminated prior to disposal in a waste drum. Once the sample analysis has been completed, using a plastic wash bottle, add bleach to the slurry and allow to filter. When the filtration is complete, dispose of the slurry in a garbage bag.

To decontaminate the sample extraction solution, add bleach equal to one half of the volume remaining in the test tube. Pour the decontaminated extraction solution into an approved waste container.

2.8 WASTE DISPOSAL

Proper disposal of hazardous waste is required by law. The Environmental Protection Agency (EPA) establishes specific guidelines; however, additional local and State laws exist in some locations. It is important that the procedures used for disposing of waste chemicals comply with the laws required at each location.

Contact the local EPA office for disposal information and names of certified waste disposal companies in the area.

a. Chemicals and Solvents.

(1) Dispose of waste according to existing local, State, and Federal laws.

(2) Select an EPA approved or certified waste disposal company in the area. The company must be able to identify the type of waste drum required, provide information regarding sample profile and waste manifest requirements, and provide estimated costs for pick-up based on the results of the sample profile.

(3) Locate waste drums in an area outside the laboratory space that complies with local fire and EPA codes. Label and date waste drums properly.

(4) Post disposal procedures at each laboratory site.

(5) Maintain accurate records with documentation from the disposal company of pick-up and delivery of the waste drums to the waste disposal site.

b. Decontaminated Materials.

Place decontaminated materials, such as filters, test kit components, and disposable lab materials into a garbage bag and dispose of in a dumpster or landfill disposal site. Only the materials that have been decontaminated may be transported. (Do not transport flammables or contaminated materials.)

c. Other.

Label excess ground corn/other grains remaining after aflatoxin testing and ground corn/other grains from official aflatoxin file samples representing grain with greater than 20 ppb: "FOR LABORATORY USE ONLY - NOT FOR USE AS FOOD OR FEEDSTUFF" and dispose of in a dumpster or landfill site.

2.9 FIELD OFFICE MANAGER RESPONSIBILITY

a. Supplement this handbook with an SOP for each testing laboratory. The SOP should be tailored to accommodate the individual workload and environment for each location.

b. Develop a Hazard Communication Program for personnel that perform tests involving hazardous materials and ensure that all personnel complete the program.

c. Contact an EPA-approved or EPA-certified waste disposal company and make arrangements for removal of chemical wastes or provide other suitable waste disposal procedures consistent with existing laws that do not create a hazard to the community.

d. Provide impermeable metal containers meeting Underwriters Laboratory approval for Class I liquids that can be tightly sealed and which are labeled "Flammable" or "Biohazardous Material" or both, as applicable, for storing waste chemicals (e.g., methanol, acetonitrile) and solutions for removal.

e. Provide plastic disposal bags for disposal of decontaminated material such as filter paper, laboratory coats, disposable pipette tips, gloves, etc.

f. Provide containers and labels for disposal of excess grain. Labels are to state "FOR LABORATORY USE ONLY - NOT FOR USE AS FOOD OR FEEDSTUFF," and are to be placed on containers prior to disposal.

g. Provide signs for the laboratory door as follows:

(1) "Biohazardous Material Present."

(2) "No Smoking, Eating, or Drinking."

(3) "Flammable Material Present."

(4) "Wear Safety Protection."

(5) "Admittance of Authorized Personnel Only."

h. Provide signs for the refrigerator, if present, as follows:

(1) "Biohazardous Material Present."

(2) "No Food or Drink to be Stored in This Refrigerator."

i. Provide adequate training for laboratory employees prior to performance of laboratory functions to include:

(1) Information conveying operations and conditions which can result in exposure to aflatoxin.

(2) Contents and availability of Material Safety Data Sheets for relevant chemical agents.

(3) Precautions to take when working with aflatoxin contaminated products, including personal hygiene, personal protection equipment, and methods of decontamination.

(4) Purpose, proper care, and limitations of dust masks and other protective equipment.

(5) Engineering and work practice controls including cleaning methods.

(6) Review of the SOP at the laboratory.

(7) Proper handling and disposal of waste.

j. Maintain the following safety and health records:

(1) Records of any employee injury or illness involving over-exposure to chemicals (29 CFR 1904; 29 CFR 1960.66 through .77b).

(2) List of employees trained and assigned to perform aflatoxin tests.

(3) Copies of any safety and health studies pertaining to the laboratory.