A CHEMICAL HYGIENE PLAN

FOR

BARRY UNIVERSITY

Barry University
11300 NE 2nd Avenue
Miami Shores, FL 33161

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CHEMICAL HYGIENE PLAN FOR BARRY UNIVERSITY

1. INTRODUCTION

This Chemical Hygiene Plan is drawn up in response to the Laboratory Standard set forth by OSHA's Occupational Exposure to Hazardous Chemicals (29 CFR 1910.1450). It is applicable to all employees who might be exposed to hazardous chemicals while working in laboratories, such as chemical or biological research and teaching laboratories, preparation areas for such laboratories, and storage and stockroom areas where such hazardous chemicals are stored. In an academic institution such as Barry University the term *employees* may include students, while the term *supervisors* may include lab managers, principal investigators (researchers), and instructors.

1.1 Chemical Hygiene Officers

Yosef Shapiro, Environmental Health & Safety Administrator, Facilities Management, (305) 899-3882 shall be the designated Chief Safety Officer for Barry University.

Maria Aloya, Laboratory Director & Chemical Stockroom Manager, Chemical Stockroom—Adrian 101B, (305) 899-3434 shall be the designated Chemical Hygiene Officer representing the department of Physical Sciences under the College of Arts & Sciences.

Lynette Cupido, Laboratory Director & Instructor, Adrian 206C, (305) 899-3297 shall be the designated Chemical Hygiene Officer representing Biology under the College of Arts & Sciences.

1.2 Emergency Contacts

Barry University Security can be reached from any campus phone by dialing extension **3333**. A registered nurse is available full-time in Student Health Services located in **Landon Student Union, room 104**, extension **3750**. For other emergencies such as fire call the Miami-Dade County emergency number **9-911**. One or more of the above Chemical Hygiene Officers should be contacted when an employee believes there has been an overexposure to any hazardous chemical.

1.3 Inventory of Hazardous Chemicals

An inventory of hazardous chemicals that employees may be exposed to shall be kept by the respective divisions listed above. For each division the laboratory manager will oversee the chemical inventory of the department's stockroom and teaching labs, while the principle investigator will oversee the chemical inventory for his or her research lab. This inventory shall be reviewed annually and revised when appropriate, such as addition or deletion of specific chemicals.

Safety Data Sheets (SDS) for these chemicals shall be kept in each division listed above. SDS are available to all employees. Very few of the chemicals are actually used by employees, and if so, only at levels below the action level or Permissible Exposure Limits (PEL).

1.4 Summary of Employer Responsibilities

As the employer, Barry University shall be responsible for the following:

1. Keep records of employee exposures to hazardous chemicals:
    a. These records should include measurements made to monitor exposures, if any, as well as any medical consultation and examinations, including written opinions.
    b. Maintain these records as mandated in 29 CFR 1910.20, Access to Employee Exposure and Medical Records.

2. Provide employees with:
    a. training and information regarding chemical and physical hazards.
    b. identification of other hazards.
    c. access to medical consultation and examinations.
    d. respirators, when necessary.

3. For incoming hazardous chemicals:
    a. Do not remove or deface labels.
    b. Keep all SDS that are received.
    c. Make SDS available to employees.

4. When hazardous chemicals are generated in a laboratory, if the:
    a. hazardous properties are known, train employees.
    b. hazardous properties are *not* known, treat the chemical as though it is hazardous and provide protection as described in this CHP.
    c. chemicals are produced for use elsewhere, follow 29 CFR 1910.20 and the various Environmental Protection Agency (EPA) and Department of Transportation (DOT) regulations that apply to that chemical.

5. If it is believed that the action level, *or* Permissible Exposure Level (PEL) if there is no action level, has been exceeded for any chemical for which a substance-specific standard has been established, the concentration of that chemical in the air must be measured.

6. If the level measured is greater than the PEL or action level, then:
   a. notify all laboratory employees of the results of the measurement, *and*
   b. comply with OSHA exposure-monitoring provisions for that chemical, as stated in 29 CFR 1910.1000 through 1910.1199.

7. Recognize our employees' right to receive, at no cost, medical consultation and examination when an:
   a. employee develops signs or symptoms of exposure,
   b. action level, or PEL if there is no action level, is routinely exceeded for any chemical for which a substance-specific standard has been established.
   c. there is a spill, leak, or explosion that makes employee exposure likely.

8. If respirators are necessary to keep exposures below the PEL or action level, follow the requirements of the Respiratory Protection Standard, 29 CFR 1910.134.

9. If select carcinogens, reproductive toxins, or acute toxins that are very highly toxic are used in the laboratory, identity and post one or more areas as "designated area(s)".

10. Before a principle investigator separates from the University, relocates to a new lab, or disposes of specialized laboratory equipment, the department head and/or lab manager will schedule an inspection with the principle investigator. The inspection will include a check-list to evaluate the vacating conditions and a clearance report based on these findings will be filed by the department head and/or lab manager. The inspection check-list may be found under section 6, “Laboratory Closeout Procedure”.

2. STANDARD OPERATING PROCEDURES

The following standard operating procedures shall apply to all employees working in any Barry University area or laboratory where there might be exposure to hazardous chemicals.

(The Standard Operating Procedure and Personal Protective Equipment Hazard Assessment Form may be found in Appendix A.)

2.1. General Rules

1. NEVER work alone in a laboratory or chemical storage area.

2. Wear appropriate eye protection at all times; see section 2.1.2.

3. When working with flammable chemicals, be certain that there are no sources of ignition near enough to cause a fire or explosion in the event of a vapor release or liquid spill.

4. Use a tip-resistant shield for protection whenever an explosion or implosion might occur.

For the chemicals they are working with, all employees should know and constantly be aware of:

1. The chemicals' hazards, as determined from the SDS, and other appropriate references.

2. Appropriate safeguards for using that chemical, including personal protective equipment.

3. The location and proper use of emergency equipment.

4. How and where to properly store the chemical when it is not in use.

5. Proper personal hygiene practices.

6. The proper methods of transporting chemicals within the facilities.

7. Appropriate procedures for emergencies, including evacuation routes, spill clean-up procedures and proper waste disposal.

2.1.1 Personal Hygiene

1. Wash promptly whenever a chemical has contacted the skin.

2. Avoid inhalation of chemicals; do not "sniff" to test chemicals.

3. Do not use mouth suction to pipet anything; use suction bulbs.

4. Wash well with soap and water before leaving the laboratory; do not wash with solvents.

5. Do not drink, eat, smoke, or apply cosmetics in the laboratory.

6. Do not bring food, beverage, tobacco, or cosmetic products into chemical storage or use areas.

2.1.2 Protective Clothing and Equipment

1. Eye protection worn when working with chemicals should meet the requirements of the American National Standards Institute (ANSI) Z87.1. Wear splash-proof safety goggles for chemical splash, spray, and mist hazards. When working with more than 10mL of a corrosive liquid, also wear a face shield, type N, large enough to protect the chin, neck, and ears, as well as the face.

2. When working with corrosive liquids, also wear gloves made of material known to be resistant to permeation by the corrosive chemical and tested by air inflation (do not inflate by mouth) for the absence of pin-hole leaks.

3. Always wear either a high-necked, calf- or ankle-length, rubberized laboratory apron *or* a long-sleeve, calf- or ankle-length, chemical- and fire- resistant laboratory coat. Always wear long-sleeved/long-legged clothing; do not wear short sleeved shirts, short trousers, or short skirts.

4. When working with allergic, sensitizing or toxic chemicals, wear gloves made of material known to be or tested and found to be resistant to permeation by the chemical and tested for the absence of pin holes.

5. Always wear low-heeled shoes with fully covering "uppers"; do not wear shoes with open toes or with uppers constructed of woven material.

6. Whenever exposure by inhalation is likely to exceed the threshold limits described in SDS, use a fume hood; if this is not possible, a proper respirator must be worn. Consult with your supervisor before doing any such work.

7. Carefully inspect all protective equipment before using. Do not use defective protective equipment.

2.1.3 Housekeeping

1. Access to emergency equipment, showers, eyewashes, and exits should never be blocked by anything not even a temporarily parked chemical cart.

2. All chemical containers must be labeled with at least the identity of the contents and the hazards those contents present to users.

3. Keep all work areas, especially laboratory benches, clear of clutter.

4. Keep all aisles, hallways, and stairs clear of all chemicals.

5. All chemicals should be placed in their assigned storage areas at the end of each workday.

6. At the end of each workday, the contents of all unlabeled containers are to be considered wastes.

7. Wastes should be properly labeled (on container the words “hazardous waste” should appear along with the complete chemical name(s)—not just “symbols” or chemical formulas) and stored in their proper containers.

8. Promptly clean up all spills; properly dispose of the spilled chemical and cleanup materials.

9. All working surfaces and floors should be cleaned regularly.

10. No chemicals are to be stored in aisles or stairwells, on desks or laboratory benches, on floors or in hallways or to be left overnight on shelves over the workbenches.

2.1.4 Prior Approval

Employees must obtain prior approval from the employer or his or her designee to proceed with a laboratory task whenever:

1. A new laboratory procedure or test is to be carried out.

2. It is likely that toxic limit concentrations could be exceeded or that other harm is likely.

3. There is a change in a procedure or test, even if it is very similar to prior practices. "Change in a procedure or test" means:
   a. 10% or greater increase or decrease in the amount of one or more chemicals used.
   b. substitution or deletion of any of the chemicals in a procedure.
   c. any change in other conditions under which the procedure is to be conducted.

4. There is a failure of any of the equipment used in the process, especially of safeguards such as fume hoods or clamped apparatus.

5. There are unexpected results.

6. Members of the laboratory staff become ill, suspect that they or others have been exposed, or otherwise suspect a failure of any safeguards.

2.1.5 Spills and Accidents

Spills of hazardous substances may be cleaned by laboratory staff, ***if***:

- they have the correct spill control materials
- they have been trained in the proper and safe handling of such materials
- the clean-up may be performed in a safe manner.

Any spill or contaminated area that may not be cleaned in a safe manner by trained laboratory staff should be resolved immediately following Barry University's Emergency Procedure Plan.

2.1.6 First Aid Kits

BARRY UNIVERSITY LABORATORY

FIRST AID KIT POLICY

The purpose of the first aid kit is to provide the tools to render temporary treatment to a person who has suffered a minor cut or burn. If the injury is more serious than a minor cut or burn, the injured person shall:

- Contact 911 first and then Public Safety at x3333 if emergency services are needed.
- Go directly to the Student Health Center located in Landon 104 for assessment and treatment during Student Health Center hours, if a student.
- File an Incident Report with Human Resources, if an employee.

1. First aid kits shall be readily accessible preferably in a highly visible location. If the kit is not visible, the area where the kit is stored shall be clearly marked.

2. Whenever the kit is used, a Barry University Laboratory Incident Report Form (Minor Incidents Only) (hereinafter, "Incident Report") shall be completed and submitted to the Laboratory Director for Biology Labs or the Laboratory Director for Physical Sciences, as applicable, who in turn shall submit a copy to the Public Safety Department. A copy of the Incident Report is attached to this policy and shall be included in the first aid kit.

3. The kit shall be maintained in serviceable condition at all times. Whenever the kit has been used, items have been removed, and an Incident Report generated, the kit shall be checked and restocked as needed by the Laboratory Director for Biology Labs or the Laboratory Director for Physical Sciences, as applicable, or their designee, including blank incident report forms.

4. The number and content of first-aid kits shall be reviewed and approved annually by the EHS administrator in conjunction with the Student Health Center.

5. The OSHA standard 29 CFR.1910 151 App A is non-mandatory, which allows a laboratory to customize the first aid kits to the hazards that might be encountered. The OSHA standard references as a guideline the American National Standards Institute—Minimum Requirements for Workplace First Aid Kits, ANSI Z308.1-2003. Therefore, the first aid kits shall only contain:

Item and Minimum Size	**Minimum Quantity**
Absorbent Compress, 4x8	1
Adhesive Bandages, 1x3in	16
Adhesive Tape, 5yd roll	1
Medical Exam Gloves	2 pairs
Sterile Pad, 3x3in	4
Triangular Bandage, 40x40x56 in.	1
Antiseptic Applications, 0.5g each	10
Burn Treatment Applications, 0.9g each	6

2.2 Procedure-Specific Safety Procedures

All laboratory procedures must contain a written description of specific safety practices incorporating the applicable precautions described in this section. Employees should read and understand these practices before commencing a procedure.

(Specific safety procedures for experiments may be found in the student's lab manual or in the hand-outs provided by the lab instructors.)

2.2.1 Procedures for Toxic Chemicals

The SDS for any of the chemicals used in the laboratory will state recommended limits or OSHA-mandated limits, or both, as guidelines for exposure. Typical limits are threshold limit values (TLV), permissible exposure limits (PEL), and action levels. When such limits are stated, they will be used to assist the chemical hygiene officer in determining the safety precautions, control measures, and safety apparel that apply when working with toxic chemicals.

1. When a TLV or PEL value is less than 50ppm or 100 mg/m^3, the user of the chemical must use it in an operating fume hood, glove box, vacuum line, or similar device, which is equipped with appropriate traps and/or scrubbers. If none are available, no work should be performed using that chemical.

2. If a TLV, PEL, or comparable value is not available for that substance, the animal or human median inhalation lethal concentration information, LC_{50}, will be assessed. If that value is greater than 200ppm or 2000 mg/m^3 (when administered continuously for one hour or less), then the chemical must be used in an operating fume hood, glove-box, vacuum line, or similar device, which is equipped with appropriate traps and/or scrubbers. If none are available, no work should be performed using that chemical.

3. Whenever laboratory handling of toxic substances with moderate or greater vapor pressures will be likely to exceed air concentration limits, laboratory work with such liquids and solids will be conducted in a fume hood, glove box, vacuum line, or similar device, which is equipped with appropriate traps and/or scrubbers. If none are available, no work should be performed using that chemical.

2.2.2 Procedure for Flammable Chemicals

In general, the flammability of a chemical is determined by its flash point, the lowest temperature at which an ignition source can cause the chemical to ignite momentarily under certain controlled conditions.

1. Chemicals with a flash point below 200°F (93.3^{o}C) will be considered "fire-hazard chemicals".

2. OSHA standards and the National Fire Protection Association (NFPA) guidelines on when a chemical is considered flammable apply to the use of flammable chemicals in the laboratory. In all work with fire-hazard chemicals follow the requirements of 29 CFR, subparts H and L; NFPA Manual 30, "Flammable and Combustible Liquids Code"; and NFPA Manual 45, "Fire Protection for Laboratories Using Chemicals".

3. Fire-hazard chemicals should be stored in a flammable-solvent storage area or in storage cabinets designed for flammable materials.

4. Fire-hazard chemicals should be used only in vented fume hoods and away from sources of ignition.

2.2.3 Procedures for Reactive Chemicals

The most complete and reliable reference on chemical reactivity is found in the current edition of "Handbook of Reactive Chemical Hazards" by L. Bretherick, published by Butterworths. Reactivity information is sometimes given in manufacturers' SDS and on labels. Guidelines on which chemicals are reactive can be found in regulations promulgated by the Department of Transportation (DOT) in 49 CFR and by the Environmental Protection Agency (EPA) in 40 CFR. Also see NFPA Manual 325M, "Fire Hazard Properties of Flammable Liquids, Gases, Volatile Solids"; Manual 49, "Hazardous Chemicals Data"; and Manual 491 M, "Manual of Hazardous Chemical Reactions".

1. A reactive chemical is one that:
   a. is described as such in Bretherick or the SDS,

b. is ranked by the NFPA as 3 or 4 for reactivity,
c. is identified by the DOT as an:
- oxidizer
- organic peroxide
- explosive, Class A, B, or C,

d. fits the EPA definition of reactive in 40 CFR 261.23,
e. fits the OSHA definition of unstable in 29 CFR 1910.1450,
or f. is known or found to be reactive with other substances.

2. Handle reactive chemicals with all proper safety precautions, including segregation in storage and prohibition on mixing even small quantities with other chemicals without prior approval and appropriate personal protection and precautions.

2.2.4 Procedure for Corrosive Chemical and Contact-Hazard Chemicals

Corrosivity, allergenic, and sensitizer information is sometimes given in manufacturers' SDS and on labels. Also, guidelines on which chemicals are corrosive can be found in other OSHA standards and in regulations promulgated by DOT in 49 CFR and the EPA in 40 CFR.

1. A corrosive chemical is one that:
   a. fits the OSHA definition of corrosive in Appendix A of 29 CFR 1910.1200,
   b. fits the EPA definition of corrosive in 40 CFR 261.22 (has a pH greater than 12 or less than 2.5), *or*
   c. is known or found to be corrosive to living tissue.
2. A contact-hazard chemical is an allergen or sensitizer that is:
   a. so identified or described in the SDS or on the label,
   b. so identified or described in the medical or industrial hygiene literature, or
   c. known or found to be an allergen or sensitizer.

3. Except as noted in 2.1.3(1), handle corrosive chemicals with all proper safety precautions, including wearing both safety goggles and face shield, gloves tested for absence of pin holes and known to be resistant to permeation or penetration, and a laboratory apron or laboratory coat.

2.2.5 Procedure for Peroxide-Forming Compounds

1. Inventories of these chemicals should be limited—only order amounts needed for the immediate experiment(s).

2. Date when chemical is first received and when container is first opened should be marked clearly on the label.

3. Store chemicals in air-tight containers, away from heat, sunlight, and ignition sources.

- Do NOT refrigerate. Do not store at or below temperatures at which peroxide freezes or solution precipitates.

4. Before distilling, always test the chemical first with peroxide test strips to ensure there are no peroxides present. NEVER distill to dryness. There should be a 10-20% residue.

5. After opening, test the chemical after 6 months with peroxide test strips. (It is recommended to test for peroxides regularly—preferably before each use). The results of peroxide tests and test dates should be marked on the outside of container.

Results of Peroxide Test Strip	Conclusion
< 25ppm	Safe
25—100ppm	Not recommended for distilling or concentrating
> 100ppm	Avoid handling. Disposal required.

6. Visual detection of dangerous high peroxide levels: peroxide crystals, precipitate, or oily viscous layer in the material. Disposal required.

7. Method of preventing peroxide formation: peroxide-forming chemicals such as diethyl ether are also sold with inhibitors such as ethanol and/or BHT (butylated hydroxytoluene).
   - If these inhibitors would interfere with the chemical reactions that need to be performed, another method of stabilizing the diethyl ether is to add a freshly prepared solution of iron (II) sulfate (for each liter of ether, use 5 g iron (II) sulfate dissolved in 20ml water).

Class A: Chemicals known to form explosive levels of peroxides without concentration

Suggested safe storage period: If unopened from manufacturer, up to 18 months or stamped expiration date, whichever comes first. After opening, materials should be discarded or evaluated for peroxides within 3 months. Store under nitrogen, if possible.

<u>Examples</u>:

Butadiene	Potassium, metal
Chlorobutadiene (Chloroprene)	Potassium amide
Divinyl acetylene	Sodium amide (sodamide)
Divinyl ether	Tetrafluoroethylene
Isopropyl ether	Vinylidene chloride

List B: Chemicals known to present peroxide hazards upon concentration (distillation/evaporation)

Suggested safe storage period: If unopened from manufacturer, up to 18 months or stamped expiration date, whichever comes first. After opening, materials should be discarded or evaluated for peroxides within 12 months.

Examples:

Acetal
Cumene
Cyclohexene
Cyclooctene
Cyclopentene
Diacetylene
Dicyclopentadiene
Diethylene glycol dimethyl ether (diglyme)
Diethyl ether
Dioxane (p-dioxane)
Ethylene glycol dimethyl ether (glyme)
Furan
Methyl acetylene
Methyl cyclopentane
Methyl isobutyl ketone
Tetrahydrofuran
Tetrahydronaphthalene
Vinyl ethers

List C: Chemical that may autopolymerize as a result of peroxide accumulation if inhibitors have been removed or are depleted

Suggested safe storage period: If unopened from manufacturer, up to 18 months or stamped expiration date, whichever comes first. After opening, materials *without inhibitors* should not be stored for longer than 24 hours. After opening, materials *with inhibitors* should be discarded or evaluated for peroxides within 12 months.

Examples:

Acrylic acid*
Chlorotrifluoroethylene
Ethyl acrylate
Methyl methacrylate*
Styrene
Vinyl acetate
Vinyl chloride
Vinyl pyridine

**Although these chemicals form peroxides, no explosions involving these monomers have been reported.*

2.3 Control Measures and Equipment

Chemical safety is achieved by continual awareness of chemical hazards and by keeping the chemical under control by using precautions, including engineering safeguards such as fume hoods. Laboratory personnel should be familiar with the precautions to be taken, including the use of engineering and other safeguards. Laboratory supervisors should be alert to detect the

malfunction of engineering and other safeguards. All engineering safeguards and controls must be properly maintained, inspected on a regular basis, and never overloaded beyond their design limits.

(Forms used for safety checks of emergency equipment may be found in Appendix B.)

2.3.1 Ventilation

1. Laboratory ventilation should be not less than eight air changes per hour (calculated). Thus flow is not necessarily sufficient to prevent accumulation of chemical vapors. Work with toxic chemicals that have low air concentration limits, or that have high vapor pressures, should always be done in a fume hood.

2. Fume hoods should provide 80 to 120 linear feet per minute of air flow.

3. Laboratory employees should understand and comply with:
   a. A fume hood is a safety backup for condensers, traps, or other devices that collect vapors and fumes. It is not used to "dispose" of chemicals by evaporation unless vapors are trapped and recovered for proper waste disposal.
   b. The apparatus inside the fume hood should be placed on the floor of the fume hood at least six inches away from the front edge.
   c. Fume hood windows should be lowered (closed) at all times except when necessary to raise (open) them to adjust the apparatus that is inside the hood.
   d. The fume hood fan should be kept "on" whenever a chemical is inside the hood, whether or not any work is being done in the hood.
      Personnel should be aware of the steps to be taken in the event of power failure or other fume hood failure.

   e. Inspect fume hood vent ducts and fans at frequent intervals to be sure they are both clean and clear of obstructions. [Depending on local circumstances, this maintenance is performed by laboratory employees or by maintenance/repair personnel.]
   f. Fume hoods should never be used as storage areas for chemicals, apparatus or other materials.

2.3.2 Flammable-Liquid Storage

1. Fire-hazard chemicals (see paragraph 2.2.2a) in quantities greater than 500mL should be kept in metal safety cans designed for such storage. The cans should be used only as recommended by the manufacturer, including the following safety practices:
   a. Never disable the spring-loaded closure.
   b. Always keep the flame-arrestor screen in place; replace if punctured or damaged.

2. Cabinets designed for the storage of flammable materials should be properly used and maintained. Read and follow the manufacturer's information and also follow these safety practices:
   a. Store only compatible materials inside a cabinet.
   b. Do not store paper or cardboard or other combustible packaging material in flammable-liquid storage cabinet.
   c. The manufacturer establishes quantity limits for various sizes of flammable-liquid storage cabinets; do not overload a cabinet.

2.3.3 Eyewash Fountains and Safety Showers

1. Equip all laboratories with eye washes and safety showers. These must be located so they can be reached from any point in the laboratory as specified in ANSI Z358.1.

2. Check the functioning of eyewash fountains and safety showers and measure the water flow at intervals specified in ANSI Z358.1. Promptly repair any facility that does not meet the water flow requirements of ANSI Z358.1.

3. Be sure that access to eye wash fountains and safety showers is not restricted or blocked by temporary storage of objects or in any other way.

2.3.4 Respirators

1. Employees should wear respirators whenever it is possible that engineering controls or work practices could become or are ineffective and that employees might be exposed to vapor or particulate concentrations greater than the PEL, action level, TLV, or similar limit, whichever is the lowest.

2. The requirements of 29 CFR 1910.134 should be followed, including in particular:
   a. Written standard operating procedures governing the selection and use of respirators.
   b. All employees who are likely to need to use respirators must be trained in their proper use, inspection, and maintenance. (See "NIOSH Guide to Industrial Respiratory Protection", DHHS Publ. No. 87-0116, NIOSH, Cincin- nati, 1987, for details.)

2.3.5 Vapor Detection

Do not use odor as a means of determining that inhalation exposure limits are or are not being exceeded. Whenever there is reason to suspect that a toxic chemical inhalation limit might be exceeded, whether or not a suspicious odor is noticed, notify the supervisor.

Laboratory workers should wear a respirator suitable for protection against the suspect chemical until measurements of the concentration of the suspect vapor in the air show that the limit is not exceeded. Under this circumstance and if there is no reason to

anticipate an increase in the concentration of the chemical, and if the supervisor approves, the respirator can be removed and the work may continue.

2.4 Procedures for Carcinogens, Reproductive Toxins, Substances That Have a High Degree of Acute Toxicity, and Chemicals of Unknown Toxicity

Follow the procedures described in this section when performing laboratory work with any select carcinogen, reproductive toxin, substance that has a high degree of acute toxicity, or a chemical whose toxic properties are unknown, when using or handling amounts greater than the amount specified for each such chemical in the current list available from the Chemical Hygiene Officer.

1. The following definitions will apply:
   a. Select carcinogen: Any substance defined as such in 29 CFR 191O.145O and any other substance described as such in the applicable SDS.

   b. Reproductive toxin: Any substance described as such in the applicable SDS or any substance identified as a reproductive toxin by the Oak Ridge Toxicology Information Resource Center (TIRC), (615) 576-1746; or for teratogens only: Any substance identified as such in Thomas H. Shepard, "Catalog of Teratogenic Agents", 6th ed., Johns Hopkins Press, 1989.

   c. Substance with a high degree of acute toxicity: Any substance for which the LD_{50} data described in the applicable SDS cause the substance to be classified as a "highly toxic chemical" as defined in ANSI Z129.1.

   d. Chemical whose toxic properties are unknown: A chemical for which there is no known statistically significant study conducted in accordance with established scientific principles that establishes its toxicity.

   e. For the purposes of this CHP, chemicals in the above four categories will be called "inimical".

   f. Designated area: A fume hood, glove box, portion of a laboratory, or an entire laboratory room designated as the only area where work with quantities of the inimical chemicals in excess of the specified limit shall be conducted.

2. Designated areas shall be posted and their boundaries clearly marked. Only those persons trained to work with inimical chemicals will work with those chemicals in a designated area. All such persons will:
   a. Use the smallest amount of chemical that is consistent with the requirements of the work to be done.
   b. Use high-efficiency particulate air (HEPA) filters or high-efficiency scrubber systems to protect vacuum lines and pumps.

c. Store inimical chemicals or remove them from storage.
d. Decontaminate a designated area when work is completed.
e. Prepare wastes from work with inimical chemicals for waste disposal in accordance with specific disposal procedures consistent with the Resource Conservation and Recovery Act (RCRA) and as designated by Barry University's hazardous waste officer.

3. Store all inimical chemicals in locked and enclosed spaces with a slight negative pressure compared to the rest of the building.

4. Because the decontamination of jewelry may be difficult or impossible, do not wear jewelry when working in designated areas.

5. Wear long-sleeved disposable clothing and gloves known to resist permeation by the chemicals to be used when working in designated areas.

3. RECORDS AND RECORD KEEPING

This section reviews the value of documenting an employer's compliance with the Laboratory Standard, which is required by 29 CFR 1910.20. This information is general; it does not include the details necessary for compliance.

1. The Laboratory Standard requires that records of air concentration monitoring results, exposure assessments, medical consultations, and examinations be maintained for at least 30 years and that these be accessible to employees or their representatives.

2. It is desirable to develop a system that retains documents related to distribution and maintenance of safety data sheets, to the safety training of employees, and to significant employee suggestions for many years, perhaps for the lifetime of the institution.

   Specific records may be required in the event of lost work time resulting from an exposure or accident on the job. Use OSHA form 300 to record lost work days that occur. Contact your local OSHA office for details.

4. In addition to required records, it is often desirable to keep records developed internally that document employee exposure complaints and suspected exposures, regardless of the outcome of an exposure assessment. Other incidents also might be documented for future reference.

   Examples include:

   a. Major safety suggestions from employees to improve laboratory safety; keep these records. A suggestion that is unusable today might be useable tomorrow. Even when a suggestion is clearly non-workable, it should be taken seriously, examined, and recorded.

   b. Near-miss reports. An employee participating in or witnessing events that could have caused harm, but fortunately did not, should prepare reports of the incidents. These reports are used to develop changes in procedures that will prevent a future more serious occurrence.

   c. Repair and maintenance records for control systems. These are useful; they suggest corrective actions and indicate that equipment was or was not well maintained and kept in working condition.

   d. Complaints from employees. It is useful to keep a record of all complaints, investigations, and outcomes. Even when not justified, especially when a complaint correctly or incorrectly involves defects in and difficulties with operating equipment, the record may prove to be invaluable if that equipment develops a defect or malfunction at a later date.

5. The EPA and other Federal and State agencies have special record keeping requirements. For example: Record keeping of allegations and the reporting of suspect hazards from the adverse effects of chemical exposure are required under Sections 8(c) and 8(e) of the Toxic Substances Control Act; see 40 CFR 7@6 and 717.

4. EMPLOYEE INFORMATION AND TRAINING

A formal session in a classroom setting to impart information or to train employees is not required, though it is often desirable for this purpose. Informal group or individual discussions with a supervisor, posted notices or handout booklets can be effective. Commercially prepared "canned" programs can also be effective, especially if supplemented with details that pertain specifically to local conditions.

OSHA does not mandate the details of the instructional method to be used. OSHA requires that, if asked by an OSHA inspector, the employees must be able to answer the issues. Hence, whatever technique or combination of techniques are used to impart information and to train, the effectiveness of the instruction should be evaluated prior to an OSHA inspection.

Some laboratory employees may not wish to participate in instructions that they perceive would be boring and repetitive. They believe that their professional or graduate training in chemistry and their accomplishments as a distinguished researcher obviate the need for further instruction. Clearly, if an employee can "pass" an evaluation of the effectiveness of instruction in matters pertaining both to safety and health hazards and to the precautions to be taken under the variety of circumstances extant in the laboratory where he or she works, then, whether or not the employer has provided such instruction, there is no reason for that employee to "sit through" any additional instructional exercises. (*Lab Safety Training Forms may be found in Appendix C.)*

1. The employer provides all laboratory employees with information and training concerning the hazards of chemicals in Barry University's laboratories.

2. The employer will provide such information and training when an employee is initially assigned to a laboratory where hazardous chemicals are present and also prior to assignments involving new hazardous chemicals and/or new laboratory work procedures.

3. Employee information. Barry University will be sure that employees are informed of:
   a. content and requirements of the Laboratory Standard.
   b. content, location, and availability of the Chemical Hygiene Plan.
   c. PEL, action levels and other recommended exposure limits for hazardous chemicals used in Barry University's laboratories.
   d. signs and symptoms associated with exposures to the hazardous chemicals used in the laboratory.
   e. location and availability of SDS and other reference materials.

4. Employee training shall include:
   a. methods and observations that may be used to detect the presence or release of a hazardous chemical.
   b. hazards associated with the chemicals used in Barry's laboratories.
   c. measures employees can use to protect themselves from these hazards including specific procedure such as appropriate work practice, personal protective equipment to be used, and emergency procedures.
   d. Barry University's Chemical Hygiene Plan.

5. EXPOSURE ASSESSMENTS, MEDICAL CONSULTATIONS, AND EXAMINATIONS

5.1 Suspected Exposures to Toxic Substances

There may be times when employees or supervisors suspect that an employee has been exposed to a hazardous chemical to a degree and in a manner that might have caused harm to the victim. If the circumstances suggest a reasonable suspicion of exposure, the victim is entitled to a medical consultation and, if so determined in the consultation, also to a medical examination at no cost with no loss of workday time attributed to the victim.
(Incident Report Forms may be found in Appendix D.)

5.1.1 Criteria for Reasonable Suspicion of Exposure

1. It is the policy of Barry University to promptly investigate all employee-reported incidents in which there is even a remote possibility of employee overexposure to a toxic substance.
2. Events or circumstances that might reasonably constitute overexposure include:
   a. A hazardous chemical leaked or was spilled or was otherwise rapidly released in an uncontrolled manner.
   b. A laboratory employee had direct skin or eye contact with a hazardous chemical.
   c. A laboratory employee manifests symptoms, such as
      - headache, rash, nausea, coughing, tearing, irritation or redness of eyes, irritation of nose or throat, dizziness, loss of motor dexterity or judgement, etc.; and
      - some or all of the symptoms disappear when the person is taken away from the exposure area and breathes fresh air, and
      - the symptoms reappear soon after the employee returns to work with the same hazardous chemicals.
   d. Two or more persons in the same laboratory work area have similar complaints.

5.1.2 Exposures

All complaints and their disposition, no matter what the ultimate disposition may be, are to be documented. If no further assessment of the event is deemed necessary, the reason for that decision should be included in the documentation. If the decision is to investigate, a formal exposure assessment will be initiated.

5.2. Exposure Assessment

In case of emergency, exposure assessments are conducted after the victim has been treated. It is not the purpose of an exposure assessment to determine that a failure on the part of the victim, or others, to follow proper procedures was the cause of an exposure. The purpose of an exposure assessment is to determine that there was, or was not, an exposure that might have caused harm to one or more employees and, if so, to identify the hazardous chemical or chemicals involved.

Other investigations might well use results and conclusions from an exposure assessment, along with other information, to derive recommendations that will prevent or mitigate any future exposures. However, exposure assessments determine facts; they do not make recommendations.

1. Unless circumstances suggest other or additional steps, these actions constitute an exposure assessment:
   a. Interview the complainant and also the victim, if not the same person.

   b. List the essential information about the circumstances of the complaint, including:
      - the chemical under suspicion
      - other chemicals used by the victim
      - all chemicals being used by others in the immediate area
      - other chemicals stored in that area
      - symptoms exhibited or claimed by the victim
      - how these symptoms compare to symptoms stated in the SDS for each of the identified chemicals
      - were control measures, such as personal protective equipment and hoods, used properly?
      - were any air sampling or monitoring devices in place? If so, are the measurements obtained from these devices consistent with other information?

2. Monitor or sample the air in the area for suspect chemicals, if there is reason to believe that the exposure level may exceed the action level or permissible exposure level.

   Cadavers used in gross anatomy labs and tissues used in research will usually contain formaldehyde (formalin) solution as the main component of the embalming fluid. During the dissection process, formaldehyde vapors are emitted resulting in exposure to both students and the instructor.
   OSHA has published several guidelines on the use and monitoring of formaldehyde:
   29 CFR 1910.1048 App A, "Substance Technical Guidelines for Formalin"
   and 29 CFR 1910.1048 App B, "Sampling Strategy and Analytical Methods for Formaldehyde" may be found in Appendix E.

3. Determine whether the victims symptoms compare to the symptoms described in the SDS or other pertinent scientific literature.

4. Determine whether the present control measures and safety procedures are adequate.

5.3 Notification of Results of Monitoring

Within 15 working days of receipt of the results of any monitoring, notify employees of those results.

5.4 Medical Consultation and Examination

The details of medical consultations and examinations are determined by the physician. The purpose of a medical consultation is to determine whether a medical examination is warranted. When, from the results of an exposure assessment, it is suspected or known that an employee was overexposed to a hazardous chemical or chemicals, the employee should obtain medical consultation from or under the direct supervision of a licensed physician.
When warranted, employees also should receive a medical examination from or under the direct supervision of a licensed physician who is experienced in treating victims of chemical overexposure. The medical professional should also be knowledgeable about which tests or procedures are appropriate to determine if there has been an overexposure; these diagnostic techniques are called "differential diagnoses".

5.4.1 The following provisions apply to medical consultations and examinations:

1. The employer must provide all employees who work with hazardous chemicals an opportunity to receive medical consultation and examination when:
   a. the employee develops signs or symptoms associated with a hazardous chemical to which the employee may have been exposed in the laboratory.
   b. monitoring, routine or otherwise, suggests that there could have been an exposure above the action level, or PEL if there is no action level, for a chemical for which a substance-specific standard has been established.
   c. there is a spill, leak, or other uncontrolled release of a hazardous chemical.

2. Provide the physician with the:
   a. identity of the hazardous chemical or chemicals to which the employee may have been exposed.
   b. exposure conditions.
   c. signs and symptoms of exposure the victim is experiencing, if any.

3. Ordinarily, physicians will furnish to the employer in written form:
   a. recommendations for follow-up, if determined to be pertinent.
   b. a record of the results of the consultation and, if applicable, of the examination and any tests that were conducted.
   c. conclusions concerning any other medical condition noted that could put the employee at increased risk.
   d. a statement that the employee has been informed both of the results of the consultation or examination and of any medical condition that may require further examination or treatment.

4. These written statements and records should not reveal specific findings that are not related to an occupational exposure.

5.4.1a *Documentation*

All memos, notes, and reports related to a complaint of actual or possible exposure to hazardous chemicals are to be maintained as part of the record, as specified under section **3: "Records and Record Keeping"** of the plan.

5.4.1b *Notification*

Employees shall be notified of the results of any medical consultation or examination with regard to any medical condition that exists or might exist as a result of overexposure to a hazardous chemical.

6. LABORATORY CLOSEOUT PROCEDURE

Laboratory supervisors (such as the principle investigator) are responsible for the "cradle to grave" management of all hazardous materials in their labs. Thus, it is important for the lab supervisor to follow a laboratory closeout procedure prior to separation from the University, relocation to a new lab, or disposal of specialized laboratory equipment.

6.1 Vacating Procedure

The following procedure should be completed before the responsible individual leaves the University or transfers to a different location on campus:

- Assure that all containers of chemicals are:
  - ✓ labeled with the name of the chemical
  - ✓ securely closed.

- All laboratory glassware must be emptied and cleaned.

- Equipment and chemical inventory MUST be updated.

- Hazardous chemical waste must be collected and labeled for disposal. Contact the lab manager for pick-up at least two weeks *before* vacating the laboratory to assure proper coordination of disposal.

- Check refrigerators, freezers, ovens, fume hoods, storage cabinets and bench tops for hazardous materials, bio-hazardous materials and cultures and thoroughly clean these locations.

- Assure that all electrical equipment is turned off and the cords unplugged from their outlet.

- Chemicals that may still be used must be specifically transferred to another principle investigator or lab manager.

- Gas cylinders must have the regulator removed and the cap secured in place. Return the gas cylinders to the supplier or specifically transfer to another principle investigator or lab manager.

6.2 Vacating Inspection

The principle investigator must schedule an inspection with the department head and/or lab manager to evaluate the vacating conditions. The department head and/or lab manager will inspect the lab according to the items listed under section 6.1, "Vacating Procedure", and will file a clearance report based on the findings. *The Laboratory Clearance Report for Vacating a Research Laboratory may be found in Appendix F.*

7. THE ELEMENTS OF AN EMERGENCY PROCEDURE PLAN

The essence of a plan to handle emergencies is summarized in the acronym **"NEAR"**:

Notify**, E**vacuate**, A**ssemble**, R**eport

- **N**otify**:** establish who notifies whom. Usually, "who notifies" is the person involved in or witnessing the incident. Depending upon the severity and complexity of the incident, that person may or may not be able to evaluate and wisely determine the actions to be taken next. For example, even for a small fire, persons closest to the scene may inadvertently choose an inappropriate means to extinguish the flames and thereby intensify the consequences.

  Although at first it may seem foolish to notify someone else instead of acting immediately to control events, it is often wiser to notify instead of acting directly. Obviously, the person to be notified should be known to be capable of making proper and prompt decisions.

- **E**vacuate: evacuation may or may not be in order; the decision should be made by the person who is notified.

- **A**ssemble: evacuees should assemble at a pre-established location.

- **R**eport**:** evacuees should report their arrival to a prior-named person or to his or her prior-named alternate. It is important to be certain that persons are or are not missing.

  Note particularly that it may be unwise to conclude too quickly on the basis of incomplete information that persons are not present at the assembly point and are, therefore, trapped within the incident area.

This brief discussion emphasizes the obvious: the best emergency plan requires detailed planning by management as well as employee training in advance of an accident, with frequent drills to make sure that those involved will act prudently and promptly should an accident occur.

APPENDICES

Appendix A

Standard Operating Procedure & Personal Protective Equipment Hazard Assessment Form

#1	CONTACT INFORMATION:
Location of Procedure	
Lab Director or Principle Investigator	
Signature	
Date of Creation / Revision	

#2	THIS STANDARD OPERATING PROCEDURE (SOP) IS FOR A:

___ **Specific laboratory procedure or experiment**

___ **Generic laboratory procedures that cover several chemicals**

___ **Generic use of a specific chemical or class of chemicals with similar hazards**

#3	PROCESS OR EXPERIMENT DESCRIPTION

Estimated Frequency in Lab:	_____ approximate number of days per week
Estimated Time in Lab:	_____ approximate number of minutes or _____hours per day

#4	SAFETY LITERATURE REVIEW & HAZARD SUMMARY

Hazard Summary

Check all physical and health hazards associated with the procedure used in the lab.

___ *Acutely Toxic (Irritant to skin, eyes or respiratory tract, skin sensitizer)*

___ *Acutely Toxic (substances that* can cause death, disability, or serious injury after a single, relatively low-level exposure)

___ *Corrosives (reactive with metals, burns skin, damages eyes)*

___ *Oxidizers*

___ *Flammables*

___ *Compressed Gases / Substances Under Pressure*

___ *Pyrophorics*

___ *Self-heating substances*

___ *Explosive (Self Reactive, Organic Peroxides)*

___ *Carcinogen, Mutagen, Reproductive Toxins*

___ *Other Explain:* _____

Safety Literature

- **Safety Data Sheets**
- **"Prudent Practices in the Laboratory Handling and Management of Chemical Hazards", 2011 edition**
- **Other:**

#5	**STORAGE REQUIREMENTS**

Describe special handling and storage requirements for hazardous chemicals in your laboratory, especially for highly reactive/unstable materials, highly flammable materials, and corrosives.

#6	**STEP-BY-STEP OPERATING PROCEDURE**

D*esignated work area(s)* - *T*he intent of a designated work area is to limit and minimize possible sources of exposure to these materials.

___ The entire laboratory ___ A portion of the laboratory ___ Chemical fume hood(s) only

Personal Protective Equipment / Emergency Safety Equipment

1. PPE (Personal Protective Equipment. (*Check all that apply)*

___ Appropriate clothing (long pants, close-toed shoes, etc.)

___ Lab coat

____ Gloves; indicate type (nitrile, latex)_____

____ Safety goggles

____ Safety glasses

____ Face shield

____ Other: _____

2. Safety equipment that serves your lab.

ITEM	STATUS
Laboratory Fume Hood/Glove Box or other Ventilation Control	___chemical fume hoods. Inspected and certified once a year.
Eyewash/Safety Shower	___eyewash/safety shower station. Tested weekly.
First Aid Kit	___First Aid Kit. Checked monthly. Refilled, as necessary.
Chemical Spill Kit	___Spill Control Kit (Acid Neutralizer, Caustic Neutralizer, and Organic Adsorber) and __Mercury Spill Kit.
Fire Extinguisher	__Fire Extinguishers. Inspected and tagged yearly.
Telephone	
Fire Alarm Manual Pull Station	__ Fire Alarm Pull Station located _____

3. Collection of hazardous chemical materials. Describe collection and storage of hazardous chemical materials for the procedure.
4. Clean up work area and lab equipment. *Describe specific cleanup procedures for work areas and lab equipment that must be performed after completion of your process or experiment.*
5. Remove PPE and wash hands.

#7	EMERGENCY PROCEDURES

A. Health-Threatening Emergencies

Examples: fire, explosion, health-threatening hazardous material spill or release, compressed gas leak, or valve failure

1. Call 9-911 (and then Public Safety at x-3333)
2. Alert people in the vicinity and activate the local alarm systems.
3. Evacuate the area and go to your Emergency Assembly Point (EAP): _____.
4. Remain nearby to advise emergency responders.
5. Once personal safety is established, call Facilities at x-3785.
6. Provide local notifications.

   Lab Director: x-3434

   Dept Chairperson: x-3433

Emergency Response Agencies

Ambulance (American Medical Response)	305-718-6400
Miami Shores Police	305-759-2468
North Shore Hospital	305-835-6000

If personnel exposed or injured:

1. Remove the injured/exposed individual from the area, unless it is unsafe to do so (because of the medical condition of the victim or the potential hazard to rescuers).
2. **Call 9-911** if immediate medical attention is required.
3. Call Public Safety at x-3333 to report the exposure.
4. Administer first aid, as appropriate.
5. Flush contamination from eyes/skin using the nearest emergency eyewash/shower for at least 15 minutes. Remove any contaminated clothing.
6. Either fax or provide hard copies of the SDS for all chemicals the victim was exposed to the Fire-Rescue personnel or to the hospital.

B. Non-Health Threatening Emergencies

For non-health threatening injuries and exposures

Student Health Center is located in Landon 104, at x-3750.

For hazardous material spills or releases which have impacted the environment (via the storm drain, soil, or air outside the building) or for a spill or release that cannot be cleaned up by local personnel:

American Compliance Technologies

CHEMTREC (chemical information)	800-424-9300	
(Chemical Emergency Transportation Center)		
Miami-Dade County Health	305-324-2400	
DCA Florida State Warning Point	850-413-9911	(Dept of Community Affairs)
Dept of Environmental Protection Agency	561-681-6600	(Southeast District Office)
Florida Poison Center	800-282-3171	
Florida Power & Light	800-468-8243	
Miami-Dade DERM	305-372-6955	
(Dept of Environmental Resources Management)		
Miami-Dade Water & Sewer	305-274-9272	
National Response Center	800-424-8802	
TECO People's Gas (North Miami Beach)	305-940-0139	

C. Small Spills/Local Cleanup:

In the event of a minor spill or release that can be cleaned up by local personnel using readily available equipment (Spill Kit):

1. Notify personnel in the area and restrict access. Eliminate all sources of ignition.
2. Review the SDS for the spilled material, or use your knowledge of the hazards of the material to determine the appropriate level of protection.
3. Wearing appropriate personal protective equipment, clean up spill. Collect spill cleanup materials in a tightly closed container. Manage spill cleanup debris as hazardous waste.
4. Have Lab Director transfer the chemical hazardous waste to the Storage Area (Chemical Stockroom).

D. Building Maintenance Emergencies (e.g., power outages, plumbing leaks):

Call Facilities Management at x-3785.

#8	**WASTE DISPOSAL**

#9	**TRAINING REQUIREMENTS**

General Training ***(check all that apply):***

___ Departmental safety training by the Lab Director

___ Safety training by the Principle Investigator / Researcher

___ Training online. Please specify: _____

___ On-campus training/workshops. Please specify: _____

___ Off-campus training/workshops. Please specify: _____

Location Where Records Maintained:	

Location of SOP: _____

Location of SDS: _____

Safety Sheets: _____

Other safety training (online, workshops on or off-campus): _____

Appendix B

Checks of Safety / Emergency Equipment

Once a week:

- Air pressure monitors
- Emergency Exit Lights Above Doors
- Eyewash / Safety Shower

Once a month:

- First Aid Kit (bandages, etc.)
- Fire Extinguishers (pin in place, pressure gauge ok, etc.)—*safety checks are documented on the tag on the fire extinguisher*

Once a year: (coordinate with Facilities / Maintenance)

- Fire Extinguishers and Fire Hose(s)—*company tags equipment*
- Biological and Chemical Fume hoods--*company tags equipment*

Air Pressure Monitor

Location: _____From _____ to _____ (dates)

Date	Initials	Status		Date	Initials	Status

Emergency Exit Lights

Location: _____From _____ to _____ (dates)

Date	Initials	Status		Date	Initials	Status

Emergency Eyewash & Shower Station

Location: _____From _____ to _____ (dates)

Date	Initials	Status		Date	Initials	Status

First Aid Kit

Location: _____From _____ to _____ (dates)

Date	Initials	Status

Appendix C: Safety Training

- **College of Arts & Sciences, Biology**
- **College of Arts & Sciences, Fine Arts**
- **College of Arts & Sciences, Physical Sciences**
- **College of Health Sciences**
- **School of Podiatric Medicine**

Appendix C-1: Lab Safety Training
College of Arts & Sciences, Biology

- **Laboratory Safety Rules**
- **List of Frequency Asked Questions & Answers**
- **Bio395-12-1201 Online Research Laboratory Training Checklist**

Laboratory Safety Rules

Personal Safety

- You may not work unsupervised—the lab instructor or lab assistant must be present.
  Unless permitted by the instructor, you may only enter the lab during your scheduled lab period.

- No smoking, eating, or drinking in the lab**.** No smoking in the immediate outside hallway to the lab.

- Wear…
  → shirts with long sleeves—sleeves should be close fitting and not "hang". Preferably: ***WEAR LAB COATS***.
  → long pants, like blue jeans or sweats—**NO shorts or short skirts are allowed**.
  → **shoes that cover the entire foot—sandals with socks are not allowed as a substitute!**
  → long hair tied back, especially when working with a Bunsen burner or hot plate.

Lab Procedures

- Pay special attention during the pre-lab for specific safety instructions including where to dispose hazardous chemical materials and biohazard contaminated materials.

- Work cautiously and do not perform any unauthorized procedure. Report any incident i*mmediately* to the instructor.

- Dispose of Biohazard Materials in the special containers provided. **SEPARATE WASTE**. Glass waste box provided.

- Never leave a Bunsen burner flame, hot plate, or <u>any</u> experiment unattended!!! Once finished, make sure to turn off all Bunsen Burners, hot plates, and any other electrical equipment used.

- Keep your work area as organized as possible—label any flask, beaker, test tube, and plats. Clean your work area when finished with the experiment.

- **WASH YOUR HANDS –**before starting the lab and
  --before leaving the lab.

Safety Equipment: know the location…

- First Aid Kit
- 1—Emergency Eyewash and Safety Shower station (back Lab Adrian 201)
- 2—Fire Extinguishers and 1 Fire Blanket
- 3—Primary Safety Exits in Adrian 202/203 lab and the secondary exit Adrian 201
- Fire Alarm—a telephone is located on the wall of the Adrian 202/203. Dian 9 *and then* 9-1-1. For Emergency use onl

Student Health Services is located in Landon 104, x-3750. After 5pm, call Public Safety at x-3333.

Right to Know Law: information on any chemicals that you are working with or are exposed to in the lab may be found in the MSDS (Material **S**afety **D**ata **S**heets) located in Wiegand 240.

Medical Condition / Pregnancy: consult with your physician as to whether or not you can work in the lab.

I have read and understood the above safety rules *and* I agree to abide by them.

PRINT Name: _____Course & Section #: _____

Signature: _____ Date: _____

List of FAQ's & Answers:

1. Who is OSHA?
   OSHA stands for the Occupational Safety and Health Administration located at an Atlanta Federal Center, 61 Forsyth Street, SW, Room 6T50, Atlanta, GA 30303 (404) 562-2300
   Contact Numbers for the State of Florida:
   Fort Lauderdale: (954) 424-0242
   Jacksonville: (904) 232-2895
   Tampa: (727) 345-1552

2. Where could I find information about the Florida Right-to-Know Laws?
   You can contact the Department of Labor and Employment Security located at 2728 Centerview Drive 349 Forest Building, Tallahassee, FL 32399-0663
   (850) 922-7021

3. What is biological hazardous waste?
   - Cultures/stocks or infectious agents or biologicals
   - Blood and blood products
   - Pathological wastes
   - Sharps
   - Contaminated liquids
   - Contaminated equipment
   - Fermentation broths
   - Tissue cultures

4. What are the methods of decontamination?
   - Autoclaving (steam must penetrate periodic validation)
   - Chemical decontamination (surfaces & equipment; disposable equipment; alcohols, aldehydes, chlorine compounds, iodine, phenolics, quat ammonium salts)
   - Incinerator (combustible bio wastes)

5. What is the dress code in a laboratory?
   Always wear appropriate protective equipment such as a lab coat or apron (sometimes approved eye protection should be worn, depending in what type of lab you are in; ask supervisor). Also, wear covered toe shoes; no sandals or canvas shoes. Your arms and legs should be covered at all times. Tie back long hair to keep it away from flames and chemicals.

6. Where do we dispose of chemicals?
   Dispose of chemicals in containers that should be available for waste chemicals, never down the drain. Broken glass should go in special containers.

7. What do we do in case of an accident or an emergency?
   Report all accidents, injuries, and close-calls to your teacher or adult supervisor immediately. Also, have someone go over to the first aid kit and have them disinfect and cover your wound. Once a month, make sure there are enough bandages, burn ointment, etc. in the first aid kit located in the laboratory.

BIO395-12-1201 ONLINE RESEARCH LABORATORY TRAINING CHECKLIST

Name	Signature	Date	OSHA Hazard Comm.	Practice Safe Science	Aquarium Safety Training	Biology Safety	General Lab Safety

Appendix C-2: Lab Safety Training
College of Arts & Sciences, Fine Arts

POLICIES OF THE BARRY UNIVERSITY PHOTOGRAPHY LABS

Health and safety are important issues, and no one in the University has a right to endanger either themselves or anyone else through uninformed or negligent use of implements, materials, or machinery. This manual has been compiled to provide basic information on safe practices and procedures in the photographic arts. It is intended to protect you and those around you. It is a basic requirement that you read and understand this manual before beginning to work in the Department of Fine Arts Photography Program. If you have any questions about the contents, please contact the department technicians or the department chair.

ACCESS TO MATERIAL SAFETY DATA SHEETS: **In accordance with the law, the Fine Art Department maintains Materials Safety Data Sheets on all chemicals in the studio areas. The MSD sheets are on file in the department office in a black and yellow notebook. These are open files for anyone wanting information about the safe handling of chemicals. Photography technicians, monitors and the department secretary or chair can provide assistance in accessing this information.**

PHOTOGRAPHY LAB EXPECTATION AND POLICIES

Students in the Fine Arts Department shall:

1. familiarize themselves with the University's expectations of student conduct, and policies and procedures, and departmental regulations associated with all of their University related activities. These policies can be found in the student handbook and in the following manual for use of the photography labs.
2. familiarize themselves with safe handling and use of all photography supplies and materials.
3. seek guidance from their instructors or supervisors concerning safety-related knowledge and skills required to ensure safe performance in their activities and actively follow and directions they receive.
4. attend safety training programs and meetings when instructed.
5. immediately report to their instructor or supervisor any accident, near miss, hazardous practice or condition with respect to their activities.
6. comply with the Health and Safety policies and procedures of other departments and institutions when they are engaged in activities in these other institutions.

Visitors shall:

1. comply with the University and photography lab's policies and procedures and all other pertinent departmental regulations.
2. agree not to use any equipment, handle any chemistry or use the labs unless given specific special permission from the department chair, and after reading the following manual and signing an acknowledgement form.

SPECIFICS ON PHOTOGRAPHY

In order to take preventative measures it is important to note the following:

How Chemicals Enter the Body:

Inhalation: This is the major route of entry for airborne chemicals. The chemicals can have a direct effect on the nose, upper respiratory tract and the lungs or they can enter the blood stream and thus affect the blood, bone, heart, brain, liver, kidneys or bladder.

Ingestion: This is not normally a direct route of entry from exposure except by willful or accidental ingestion. Materials can also enter the stomach through indirect means. For example, the lung has a cleaning mechanism which pushes material out of the lung where it can be swallowed. This can result in an exposure to most of the internal organs or even in a local action on the stomach wall.

Skin Contact: Some materials are absorbed through the skin and therefore when they enter the bloodstream they can be transported throughout the body and accumulate in, or affect, the most sensitive areas of the body. Skin contact can also result in allergic reaction, the removal of the protective skin oil, or dermatitis. In some cases, the chemical contact may result in a cancerous lesion. Note: More detailed information on the hazards of chemicals found in art materials can be found in the Reading Room.

Arts and Reproduction:
Many chemicals used in art can also affect the reproductive system. Some chemicals have specific effects on the male reproductive system, e.g., cadmium, manganese, and lead. Others have specific effects on the female reproductive system, e.g., toluene and xylene, which cause menstrual irregularities. All of these chemicals are common in art materials.

High Risk Groups:

Pregnant and Breast-feeding Women: Chemicals and other factors which are thought to cross the placental barrier and possibly cause damage and birth defects, include lead, cadmium, mercury, copper, carbon monoxide, dyes, noise, vibration, and many organic solvents. The amount of material necessary to damage the fetus or embryo is much smaller than the amount which can injure the adult. The most sensitive time for chemical interference with normal development is from the 18th to the 60th day after conception. Other hazards include materials that can affect the respiratory and circulatory systems. Examples include solvents, dyes, metals, toxic dusts and gases, as well as strenuous activity and other stresses. Many chemicals, especially heavy metals and solvents, can be found in a woman's milk several hours after exposure and can affect the infant. AVOID USE OF SOLVENTS AND AEROSOLS.

Children: Children are more susceptible to the effects of hazardous chemicals than adults are and they should be closely supervised in the studio environment.

Smokers and Heavy Drinkers: These individuals are at a higher risk of damage to their lungs and liver respectively. Nicotine and/or alcohol mixed with toxic chemicals in art materials can cause synergistic and multiplicative reactions.

Individuals on Medications: Medications also create a greater risk. Consult your physician to ensure that any medication will not interact with substances in art materials to cause illness.

Note: Also within the high-risk group are the physically disabled, the elderly, and those with allergies or illnesses.

PHOTOGRAPHY CHEMISTRY DETAILS

1.)Developing Baths

The most commonly used developer are hydro-quione, monomethyl para-aminophenol sulfate, and phenidone. Other common components of developing baths include an accelerator. often sodium carbonate or borax, sodium sulfite as a preservative and potassium bromide as a restrainer or antifogging agent.

Health General

Developers are commonly available in powder form and must be dissolved to make the developing bath. They are skin and eye irritants, and some are strong sensitizers. Monomethyl paraaminophenol sulphate creates many skin problems and allergies to it are frequent. Hydroquinone can cause depigmentation and eye injury after 5 or more years of continual exposure. Catechol and pyrogallol can be absorbed through the skin to cause severe poisoning. Phenidone is only slightly toxic by skin contact. Most developers are highly toxic by ingestion (some fatalities have occurred by accidentally drinking developer solution). Inhalation of powders is also hazardous.

Specifically:

1. Para-phenylene diamine and some of its derivatives are highly toxic by skin contact, inhalation, and ingestion. They cause very severe skin allergies and can be absorbed through the skin.
2. Sodium hydroxide, sodium carbonate, and other alkalis used as accelerators are moderately to highly corrosive by skin contact or ingestion. This is a particular problem with the pure alkali or with concentrated stock solutions.
3. Potassium bromide is moderately toxic by inhalation or ingestion and slightly toxic by skin contact. Symptoms of systemic poisoning include somnolence, depression. Lack of coordination, mental confusion, hallucinations and skin rashes.
4. Sodium sulfite is moderately toxic by ingestion or inhalation causing gastric upset, colic, diarrhea, circulatory problems, and central nervous system depression. It is not appreciably toxic by skin contact. If heated or allowed to stand for a long period in water or acid, it decomposes to produce sulfur dioxide which is highly irritating by inhalation.

Precautions

1. Wear rubber gloves and goggles when handling developers in powder form or liquid solution. Wash gloves off before using again. Wear an approved dust respirator when pouring developer dusts.

2. Do not put your bare hands in developer baths. Use tongs instead. If developer solution splashes on your skin or eyes, immediately flush with water and report to the campus health center.
3. Label all solutions carefully to avoid accidental ingestion.
4. Do not use para-phenylene diamine or its derivatives if at all possible.

2.) Stop Baths

Stop baths are usually weak solutions of acetic acid. Acetic acid is commonly available as pure glacial acetic acid or 28% acetic acid. Some stop baths contain potassium chrome alum as a hardener.

Health Hazards

1. Acetic acid, in concentrated solutions, is highly toxic by inhalation, skin contact and ingestion. It can cause dermatitis and ulcers, and can strongly irritate the mucous membranes. The final stop bath is only slightly hazardous by skin contact. Continual inhalation may cause chronic bronchitis. However contamination of the stop bath by developer components can increase the hazard.
2. Potassium chrome alum or chrome alum (potassium chromium sulfate) is moderately toxic by skin contact causing dermatitis, allergies, and skin ulcers which might take a longtime to heal. It is highly toxic by inhalation.

Precautions:

1. Wear gloves and goggles when handling concentrated solutions of acetic acid or when handling chrome alum. Always add acids to water, never the reverse.
2. All darkrooms require good ventilation to control the level of acetic acid vapors and other vapors and gases produced in photography. Kodak recommends at least 10 air changes per hour for work rooms and local exhaust ventilation for processing and mixing tanks which produce toxic vapors or gases.
3. Cover the acid bath (and other baths) when not in use to prevent evaporation or release of toxic vapors and gases.
4. Store concentrated acids and other corrosive chemicals on low shelves so as to reduce the chance of eye or face injury in case of breakage.

Fixing Baths

Fixing baths contain hypo or sodium thiosulfate as the fixing agent, acetic acid to neutralize developing action, and sodium sulfite as a preservative. Some fixing baths are hardened with alum (potassium aluminum sulfate) and boric acid (ag a buffer).

Health Hazards:

1. In powder form sodium thiosulfate is not significantly toxic by skin contact. By ingestion it has a purging effect on the bowel8 Upon heating or long standing in solution, it can decompose to form highly toxic sulfur dioxite, which can cause chronic lung problems.

2. Alum (potassium aluminum sulfate) is only lightly toxic. It may cause skin allergies or irritation in a few people.
3. Boric acid is moderately toxic by ingestion or inhalation and slightly toxic by skin contact (unless the skin is abraded or burned, in which case it can be highly toxic).
4. See previous sections for hazards of sodium sulfite and acetiC acid.

Precautions

1. Ventilate the fixing bath as described in the previous section.
2. Follow the named precautions for mixing, handling, and using chemicals as described in previous section.

3.) Intensifiers and Reducers

A common after treatment of negatives (and occasionally prints) is either intensification or reduction. [Intensification involves bleaching of the negative and subsequent redeveloping of the image. In this process, other heavy metals are usually added to the silver. Common intensifiers include mercuric chloride followed by ammonia or sodium sulfite, Monckhoven's intensifier consisting of a mercuric iodide/sodium sulfite, potassium bromide, and uranium nitrate. Reduction of negatives is usually done with Farmer's reducer, consisting of potassium ferrocyanide and hypo. Reduction can also be done with iodine/potassium cyanide, ammonium persulfate, and potassium permanganate/ sulfuric acid.

Health Hazards

1. Potassium or sodium cyanide are highly toxic by inhalation and ingestion. Stomach acids can convert salt into the highly poisonous gas hydrogen cyanide. This can also happen if cyanide salts are treated with acid.
2. Potassium ferrocyanide, although only slightly toxic by itself, will release hydrogen cyanide gas if heated, if hot acid is added, or if exposed to strong ultra-violet light (e.g. carbonarcs).
3. Potassium chlorochromate can release highly toxic chlorine gas if heated or if acid is added.

Precautions:

1. Dichromate intensifiers are probably the least toxic you can use. However, gloves and goggles should still be worn when preparing and using them.
2. Do not expose potassium chlorochromate to acid or heat.
3. If possible do not use cyanides. If it is necessary to use them, do so only in a fume hood or other local exhaust hood. Take very careful precautions to ensure that cyanide solutions do not become contaminated with acids. Have an antidote kit available.
4. The safest reducer to use is farmer's reducer. Do not expose farmer's reducer to hot acid, ultraviolet light, or heat.

4.) Toner

Toning a print usually involves replacement of silver by another metal, for example gold, selenium, uranium, platinum, or iron. In some cases the toning involves the replacement of silver metal by the

brown silver sulfide, for example, in the various types of sulfide toners. A variety of other chemicals are also used in the toning solutions.

Health Hazards

1. Many of the metals used in toning are highly toxic, particularly by ingestion.
2. Sodium and potassium sulfide release the highly toxic gas hydrogen sulfide when treated with acid. Similarly, treatment of selenium salts with acid may release highly toxic hydrogen selenide gas.
3. Thiourea is a suspected carcinogen since since it causes cancer in animals.

Precautions:

1. Carry out normal precautions for handling toxic chemicals as described in previous sections. In particular wear gloves, goggles, and dust respirator when mixing and handling acids and alkalis.
2. Take precautions to make sure that sulfide or selenium toners are not contaminated with acids. For example, with two bath sulfide toners, make sure you rinse the print well after bleaching in acid solution before dipping it in the sulfide developer.

5.) Other Photographic Chemicals

Many other chemicals are also used in black and white processing, including formaldehyde as a prehardener, a variety of strong oxidizing agents as hypo eliminators (e.g. hydrogen peroxide and ammonia, potassium permanganate, bleaches and potassium persulfate), sodium sulfide to test for residual silver, silver nitrate to test for residual hypo, solvents such as methyl chloroform and freons for film and print cleaning, and concentrated acids to clean trays.

Health Hazards

Concentrated sulfuric acid mixed with potassium permanganate or potassium dichromate produces highly corrosive permanganic and chromic acids. Hypochlorite bleaches can release highly toxic chlorine gas when acid is added or it is heated. Potassium persulfate and other strong oxidizing agents can be explosive when in contact with easily oxidizable materials such as many solvents and organic materials. Formaldehyde is a throat, eye and respiratory system irritant, which can also cause dermatitis and asthma. It is a suspected carcinogen.

Precautions

1. Cleaning acids should be handled with great care. Wear gloves and goggles and make sure the acid is always added to the water when diluting. An acid-proof apron should be worn to protect your body against splashes. The acid should be disposed of by pouring down the sink very slowly and flushing with water continually for at least 15 min. afterward.
2. Do not add acid to hypochlorite bleaches and do not heat.
3. Keep potassium persulfate and other strong oxidizing agents separate from flammable and easily oxidizable substances.
4. The hazards of formaldehyde can be minimized through dilution ventilation, such as an exhaust fan.

Note:

Most photographic chemicals, diluted in solutions normally used in processing, contain relatively low concentrations of toxic substances and therefore have low toxicity ratings for ingestion. Swallowing these solutions may produce mild transient gastro-intestinal symptoms. However, some toxicologists believe that major potential for hazards lies in continuous inhalation and skin absorption of these chemicals over long periods of time. Photographers expose themselves to vapors rising from large surfaces of trays, especially when darkroom temperatures exceed 21 C. and ventilation is poor. They expose the skin of their hands to all of these chemicals as they handle prints and move them through the various stages of processing. Low-level exposure to photographic chemicals is believed to have a cumulative effect on the various organs, such as the liver and kidneys, that must metabolize, store or excrete them, and on the central nervous system and respiratory tract. Such exposure has also led to the development of asthma and the worsening of other pre-existing lung conditions for some photographers, students and other persons living in close proximity to unventilated darkrooms.

WHAT YOU SHOULD DO

Everyone who works with photographic chemicals should have a basic understanding of the nature of chemicals and their interaction with each other. Photographers and artists should adhere to the following procedures in order to avoid injury or illness:

1. ALWAYS check that the ventilators are turned on in the darkroom.
2. Wear eye protection when using power equipment, filing, sanding, grinding, polishing an object or when mixing or pouring chemistry.
3. Wear a dust mask or ventilator when sanding, filing or spraying any materials or mixing and pouring chemistry.
4. Use good housekeeping practices. Wipe up all spills and splashes promptly; dispose of rags and papers contaminated with chemicals.
5. Use aerosol spray products only in a spray booth or with efficient exhaust ventilation.
6. Avoid skin contact with chemicals by using protective gloves or tongs.
7. Wash hands frequently and thoroughly.
8. Change work clothes and launder them frequently. Wash hands well before eating, smoking, or using the toilet.
9. Do not smoke, eat, or drink in the photograph labs. This includes classrooms.
10. Never lean over trays, tanks or open containers while printing or mixing chemistry or for prolonged periods without a mask and goggles.
11. Avoid injury by lifting heavy objects properly and with help.
12. Do not light fires or use heat equipment in the presence of chemistry and in areas that are not set up for that usage.
13. Label materials and chemistry clearly and properly and store them in safe containers.
14. SUBSTITUTE less hazardous materials or techniques when possible. There are many instances where highly toxic chemicals can be replaced by less toxic materials.

15. KNOW the materials and their hazards. If labels do not adequate information regarding contents, hazards, and precautions, use resource books to research the product your health is worth the effort.
16. ASK if you are unsure about the operation of any equipment. Misuse of tools leads to accidents. No equipment is to be altered or modified unless on manufacturers recommendation.
17. In case of serious emergency, first dial 9-11, *then* call public safety.
18. Phone numbers and procedures for dealing with any injuries in the lab are posted in the main classroom near the computers in case of emergency.

DARKROOM SAFETY PROCEDURES ACKNOWLEDGEMENT AND AGREEMENT

In signing this form, I acknowledge that I have read thorougly and understand the risks, procedures and expectations set forth in safely handling materials in the photography lab.

I also agree to follow these policies and procedures as well as adhere to the Barry University student code of conduct, as outlined in the student handbook, when I am working in the photography labs.

_____ _____
Student Date

_____ _____
Technician Date

Appendix C-3: Lab Safety Training
College of Arts & Sciences, Physical Sciences

- **Laboratory Safety Rules**
  - **General Rules, Teaching Labs (Chemistry, Physics)**
  - **Lab Assistants (Chemistry, Physics)**
  - **Lab Instructors (Chemistry, Physics)**
  - **Lab Technician**
  - **Research Lab Safety Guidelines (Chemistry)**

- **Chemical Safety Seminar, General Guidelines**

Laboratory Safety General Rules per Teaching Lab (Chemistry Students)

Personal Safety

- You may not work unsupervised—the lab instructor or lab assistant must be present.
  Unless permitted by the instructor, you may only enter the lab during your scheduled lab period.

- No smoking, eating, or drinking in the lab**.** No smoking in the immediate outside hallway to the lab.

- Wear…
  → safety goggles while working in the lab. Absolutely NO exceptions!
  → shirts with long sleeves—sleeves should be close fitting and not "hang". *Option: wear lab coat*.
  → long pants, like blue jeans or sweats—NO shorts or short skirts are allowed.
  → shoes that cover the *entire* foot—*sandals with socks are not allowed as a substitute!*
  → long hair tied back, especially when working with a Bunsen burner or hot plate.

Lab Procedures

- Pay special attention during the pre-lab for specific safety instructions including where to dispose hazardous chemical materials.

- Work cautiously and do not perform any unauthorized procedure. Report any incident i*mmediately* to the instructor.

- To smell a chemical use an "indirect" technique such as wafting. Use a fume hood when working with any volatile substance.

- Never leave a Bunsen burner flame, hot plate, or <u>any</u> reaction unattended!!! Once finished, make sure to turn off all Bunsen Burners, hot plates, and any other electrical equipment used.

- Keep your work area as organized as possible—label any flask, beaker or test tube containing chemicals. Clean your work area when finished with the experiment.

- **WASH YOUR HANDS** before leaving the lab.

Safety Equipment: know the location…

- First Aid Kit
- Emergency Eyewash and Safety Shower station
- Fire Extinguishers and 1 Fire Blanket
- Primary Safety Exits
- Fire Alarm / Telephone

Student Health Services is located in Landon 104, x-3750. After 5pm, call Public Safety at x-3333.

Right to Know Law: information on any chemicals that you are working with or are exposed to in the lab may be found in the SDS (**S**afety **D**ata **S**heets) located in Wiegand 121.

Medical Condition / Pregnancy: consult with your physician as to whether or not you can work in the lab.

I have read and understood the above safety rules *and* I agree to abide by them. A copy of the safety rules are in the lab manual.

PRINT Name: _____Course & Section #: _____

Signature: _____ Date: _____

Laboratory Safety Rules Wiegand 150 (Physics Students)

Personal Safety

- You may NOT enter the lab outside of your scheduled lab period, unless you are permitted by the instructor.

- No smoking, eating, or drinking in the lab.

- Wear appropriate attire…
  - → Avoid wearing overly bulky or loose-fitting clothing that may become entangled with the experimental apparatus. Roll up loose sleeves.
  - → Long pants, like blue jeans or sweats—no shorts or short skirts.
  - → Shoes that cover the entire foot—no sandals.
  - → Long hair should be tied or pinned back.

- Keep your hands dry during the course of an experiment, *especially* when using electrical equipment.

Lab Procedures

- Pay special attention during the pre-lab for specific safety instructions including where to dispose of hazardous chemical materials.

- Work cautiously and do not perform any unauthorized procedure. Report any incident *immediately* to the instructor. Broken mercury thermometers are to be disposed by the instructor.

- <u>Electrical equipment</u>
  - → Do not use any electrical device with frayed wiring, broken insulation, or exposed wiring.
  - → If you must connect an electrical circuit, ask the instructor to check the wiring *before* turning on any electrical devices. Special attention required when working with capacitors, high voltage, and high current power supplies.
  - → With optics experiments, be cautious of light bulbs and white light sources which may become hot enough to burn you.

- <u>Low power diode and helium neon lasers</u>
  Do NOT put your eyes directly in the path of a laser beam. (These lasers are not dangerous to the skin but if a laser beam hits the retina of the eye, it may damage it permanently.)

Safety Equipment: know the location…

- First Aid Kit
- 2—Fire Extinguishers and 1 Fire Blanket.
- 2—Primary safety exits in Wiegand 150 lab and the secondary exit (door leading into Wiegand 151 lab).
- Fire Alarm—pull-station is located on wall adjacent to office Wiegand 129.
- Telephone—located in Wiegand 149—office inside the Physics Lab. Dial 9 *and then* 9-1-1.

Student Health Services is located in Landon 104, x-3750. After 5pm call Public Safety at x-3333.

Right to Know Law: information on any chemicals that you are working with or are exposed to in the lab may be found in the SDS (Safety Data Sheets) located in Wiegand 121.

Medical Condition / Pregnancy: consult with your physician as to whether or not you can work in the lab.

I have read and understood the above safety rules *and* I agree to abide by them.
A copy of the safety rules are in the lab manual.

PRINT Name: _____Course & Section #: _____

Signature: _____ Date: _____

Laboratory Assistant Safety Training (Chemistry)

Training Procedure

The Lab Director will give a tour of the lab(s) and show the location and use of all safety features.

Personal Safety

- Must wear safety goggles at all times during an experiment or preparations of any solution.
- Wear long pants, like blue jeans. NO SHORTS allowed. Wear shirts with long sleeves in which the sleeves are close fitting and do not "hang" (a lab coat may be worn instead).
- Wear shoes that cover the entire foot—sandals with socks are not allowed as a substitute!
- NO smoking, eating or drinking in the lab. No smoking in the immediate outside hallway to the lab or to the stockroom.
- Know the location and use of safety features in the stockroom as well as the teaching labs including Wiegand 150, Adrian 104, Adrian 106 and SNHS 116.

Safety features include safety exits—primary and secondary. Know the location of the nearest Fire Blanket. If there is a fire or suspected fire: follow the "R.A.C.E." acronym : Rescue – Alarm – Contain – Extinguish

Rescue

Immediately stop what you are doing and remove anyone in immediate danger from the fire to a safe area.

Alarm

Activate the nearest fire alarm pull stations (if applicable).

Call 911 (dial 9 and then 9-1-1 when using campus phone) to report the location and current extent of the fire.

Contain

Close all doors and windows that you can safety reach to contain the fire.

During evacuation close the doors behind you.

Extinguish

The instructor or lab personnel will attempt to extinguish the fire ONLY if it is safe for them to do so.

They will follow the "P.A.S.S." procedure:

P = Pull the pin breaking the plastic seal

A = Aim at the <u>base</u> of the fire

S = Squeeze the handles together

S = Sweep from side to side.

Eyewash and shower stations: person should rinse for at least 15 minutes with water. Check Safety Data Sheets for First Aid measures, in case rinsing requires a longer period of time.

First aid kits: students may use the First Aid Kit. No matter how small the injury, an Incident Report form should be filled out and forwarded to the Lab Director.

Chemical spill kits: know their location and general usage.

- In case of an emergency, important phone numbers
  (These numbers are also posted by the phones in the Physical Sciences labs)
  Student Health Services: Landon 104, x-3750.
  Fire Alarm: dial 9 and then 9-1-1 9 (when dialing from a campus phone)
  Campus Security: x-3333
  Florida Poison Center: dial 9 and then 800-282-3171
  Physical Sciences
  Lab Director: x-3434
  Chairperson: Dr. Zajickova, x-3238

- If you must smell a chemical, then use an "indirect" technique such as wafting.

- Mouth pipetting is not allowed. Use pipette bulbs.

Safe Disposal of Hazardous Materials

- Hazardous waste does not go down the drain (sink). Place in an appropriate, labeled container.

→ Container should have the words "Hazardous Waste". In ink, chemical names of all chemicals in container should be written clearly (no chemical formulas or abbreviations). When container is deemed "full", contact the lab director to transfer container from lab to chemical stockroom.

- All broken glassware (except mercury thermometers) goes in the blue and white cardboard box.

- Broken mercury thermometers should be taped and left aside while the spilt mercury is placed in a mercury waste container.

- Any spilled chemical must be taken care of immediately. Contact the lab director for assistance.

- Wash your hands thoroughly with soap and water when you have finished working in a lab or stockroom.

Right to Know

You have the right to request information on the chemicals that you are working with or being exposed to in the lab or stockroom. The information may be found in the SDS (Safety Data Sheet) located in Wiegand 121.

Medical Condition

If you are pregnant or have a medical condition that might be affected from working with chemicals, then consult your physician as to whether or not you may work in the lab.

Clean-up

At the end of a lab session, do the following checks….

- Cap all reagent bottles tightly and return to designated lab bench.
- Close all containers located in the fume hood. Clean any spills.
- Turn off and unplug from electrical outlets all hot plates, melting point apparatus, etc.
- Gas valves must be completely closed.
- Turn off lights and lock all doors to the lab.

Tardiness/Absence

Show up to work on time. If for whatever reason you cannot show up to work or will be late, then please notify the lab director (call or send an e-mail).

You may work only during your scheduled hours under the supervision of the lab director or laboratory instructor.

The lab director has gone over the safety rules as listed on pages one and two and has shown the location of safety features in the labs as well as in the stockroom.

I agree to uphold the above duties and follow the safety rules as described. If I have any questions, then I will ask the lab director for assistance.

Print name: _____

Signature: _____ Date: _____

Laboratory Assistant Safety Training (Physics)

Personal Safety

- Students may NOT enter the lab outside of your scheduled lab period, unless permitted by the instructor.

- No smoking, eating, or drinking in the lab.

- Wear appropriate attire…
  - → Avoid wearing overly bulky or loose-fitting clothing that may become entangled with the experimental apparatus.
    Roll up loose sleeves.
  - → Long pants, like blue jeans or sweats—no shorts or short skirts.
  - → Shoes that cover the entire foot—no sandals.
  - → Long hair should be tied or pinned back.

- Keep your hands dry during the course of an experiment, *especially* when using electrical equipment.

Lab Procedures

- Pre-lab will offer specific safety instructions including where to dispose of hazardous chemical materials.

- Students must work cautiously and not perform any unauthorized procedure. Students must report any incident *immediately* to the instructor. Broken mercury thermometers are to be disposed by the instructor.

- <u>Electrical equipment</u>
  - → Do not use any electrical device with frayed wiring, broken insulation, or exposed wiring.
  - → If you must connect an electrical circuit, ask the instructor to check the wiring *before* turning on any electrical devices. Special attention required when working with capacitors, high voltage, and high current power supplies.
  - → With optics experiments, be cautious of light bulbs and white light sources which may become hot enough to burn you.

- <u>Low power diode and helium neon lasers</u>
  Do NOT put your eyes directly in the path of a laser beam. (These lasers are not dangerous to the skin but if a laser beam hits the retina of the eye, it may damage it permanently.)

Safety Equipment: know the location…

- First Aid Kit
- 2—Fire Extinguishers and 1 Fire Blanket.
- 2—Primary safety exits in Wiegand 150 lab and the secondary exit (door leading into Wiegand 151 lab).
- Fire Alarm—pull-station is located between the Wiegand 124 and 125 offices.
- Telephone—located in Wiegand 149—office inside the Physics Lab. Dial 9 *and then* 9-1-1.

Student Health Services is located in Landon 104, x-3750. After 5pm call Public Safety at x-3333.

Right to Know Law: information on any chemicals that you are working with or are exposed to in the lab may be found in the SDS (Safety Data Sheets) located in Wiegand 121.

Medical Condition / Pregnancy: consult with your physician as to whether or not you can work in the lab.

I have read and understood the above safety rules *and* I agree to abide by them.
A copy of the safety rules are in the lab manual.

PRINT Name: _____

Signature: _____ Date: _____

Laboratory Instructor Safety Training (Chemistry)

Training Procedure

The Lab Director will give a tour of the lab(s) and show the location and use of all safety features.

Instructor (and Lab Assistant) must adhere to the safety rules and enforce the safety rules upon those students attending the lab.

Personal Safety

- Must wear safety goggles at all times during an experiment or preparations of any solution.
  Note: As long as one person is working with chemicals in the lab, then everyone in that lab must continue to wear their safety glasses/goggles.

- Wear long pants, like blue jeans. NO SHORTS allowed. Wear shirts with long sleeves in which the sleeves are close fitting and do not "hang" (a lab coat may be worn instead).

- Wear shoes that cover the entire foot—sandals with socks are not allowed as a substitute!

- NO smoking, eating or drinking in the lab. No smoking in the immediate outside hallway to the lab or to the stockroom.
  Note: Instruct students to leave their food items in the shelf area for "backpacks". Absolutely no food or drinks on the lab benches.

- If you must smell a chemical, then use an "indirect" technique such as wafting.

- Mouth pipetting is not allowed. Use pipette bulbs.

- Know the location and use of safety features in the stockroom as well as the teaching labs including Wiegand 150, Adrian 104, Adrian 106 and SNHS 116.

  Safety features include safety exits—primary and secondary. Know the location of the nearest Fire Blanket. If there is a fire or suspected fire: follow the "R.A.C.E." acronym : Rescue – Alarm – Contain – Extinguish

Rescue

Immediately stop what you are doing and remove anyone in immediate danger from the fire to a safe area.

Alarm

Activate the nearest fire alarm pull stations (if applicable).

Call 911 (dial 9 and then 9-1-1 when using campus phone) to report the location and current extent of the fire.

Contain
Close all doors and windows that you can safety reach to contain the fire.
During evacuation close the doors behind you.
Extinguish
The instructor or lab personnel will attempt to extinguish the fire ONLY if it is safe for them to do so.
They will follow the "P.A.S.S." procedure:
P = Pull the pin breaking the plastic seal
A = Aim at the base of the fire
S = Squeeze the handles together
S = Sweep from side to side.

Eyewash and shower stations: person should rinse for at least 15 minutes with water. Check Safety Data Sheets for First Aid measures, in case rinsing requires a longer period of time.

First aid kits: students may use the First Aid Kit. No matter how small the injury, an Incident Report form should be filled out and forwarded to the Lab Director.

Chemical spill kits: know their location and general usage.

- In case of an emergency, important phone numbers
  (These numbers are also posted by the phones in the Physical Sciences labs)
  Student Health Services: Landon 104, x-3750.
  Fire Alarm: dial 9 and then 9-1-1 9 (when dialing from a campus phone)
  Campus Security: x-3333
  Florida Poison Center: dial 9 and then 800-282-3171
  Physical Sciences
  Lab Director: x-3434
  Chairperson: Dr. Zajickova, x-3238

- Incident Report Forms—if a student has any type of accident in the lab (or any case that involves calling Student Health Center or 911), then you must fill out an Incident Report Form and submit it to the Lab Director.

Safe Disposal of Hazardous Materials

- Hazardous waste does not go down the drain (sink). Place in an appropriate, labeled container. When in doubt, ask the lab director!!!

- All broken glassware (except mercury thermometers) goes in the blue and white cardboard box.

- Broken mercury thermometers should be taped and left aside while the spilt mercury is placed in a mercury waste container.

- Any spilled chemical must be taken care of immediately. Contact the lab director for assistance.

- Wash your hands thoroughly with soap and water when you have finished working in a lab or stockroom.

Right to Know

You have the right to request information on the chemicals that you are working with or being exposed to in the lab or stockroom. The information may be found in the SDS (Safety Data Sheet) located in Wiegand 121.

Medical Condition

If you are pregnant or have a medical condition that might be affected from working with chemicals, then consult your physician as to whether or not you may work in the lab.

Clean-up

At the end of a lab session, do the following checks (you may have your Lab Assistant help)….

- Cap all reagent bottles tightly and return to designated lab bench.
- Close all containers located in the fume hood. Clean any spills.
- Turn off and unplug from electrical outlets all hot plates, melting point apparatus, etc.
- Gas valves must be completely closed.
- Turn off lights and lock all doors to the lab.

Tardiness/Absence

Show up to work on time. If for whatever reason you cannot show up to work or will be late, then please notify the lab director (call or send an e-mail).

The lab director has gone over the safety rules as listed on pages one and two and has shown the location of safety features in the labs as well as in the stockroom.

I agree to uphold the above duties and follow the safety rules as described. If I have any questions, then I will ask the lab director for assistance.

Print name: _____

Signature: _____ Date: _____

Laboratory Instructor Safety Training (Physics)

Personal Safety

- Students may NOT enter the lab outside of your scheduled lab period, unless permitted by you.

- No smoking, eating, or drinking in the lab.

- Wear appropriate attire…
  - → Avoid wearing overly bulky or loose-fitting clothing that may become entangled with the experimental apparatus.
    Roll up loose sleeves. Long pants, like blue jeans or sweats—no shorts or short skirts.
  - → Shoes that cover the entire foot—no sandals.
  - → Long hair should be tied or pinned back.

- Keep your hands dry during the course of an experiment, *especially* when using electrical equipment.

Lab Procedures

- Pre-lab should include specific safety instructions including where to dispose of hazardous chemical materials.

- Students must work cautiously and not perform any unauthorized procedure. Students must report any incident *immediately* to you, the instructor. Broken mercury thermometers are to be disposed only by the instructor.

- <u>Electrical equipment</u>
  - → Students must not use any electrical device with frayed wiring, broken insulation, or exposed wiring.
  - → If a student must connect an electrical circuit, the student should ask the instructor to check the wiring *before* turning on any electrical devices. Special attention required when working with capacitors, high voltage, and high current power supplies.
  - → With optics experiments, students should be cautious of light bulbs and white light sources which may become hot enough to burn.

- <u>Low power diode and helium neon lasers</u>
  Do NOT put your eyes directly in the path of a laser beam. (These lasers are not dangerous to the skin but if a laser beam hits the retina of the eye, it may damage it permanently.)

Safety Equipment: know the location…

- First Aid Kit
- 2—Fire Extinguishers and 1 Fire Blanket.
- 2—Primary safety exits in Wiegand 150 lab and the secondary exit (door leading into Wiegand 151 lab).
- Fire Alarm—pull-station is located between the Wiegand 124 and 125 offices.
- Telephone—located in Wiegand 149—office inside the Physics Lab. Dial 9 *and then* 9-1-1.

Student Health Services is located in Landon 104, x-3750. After 5pm call Public Safety at x-3333.

Right to Know Law: information on any chemicals that you your students are working with or are exposed to in the lab may be found in the SDS (Safety Data Sheets) located in Wiegand 121.

Medical Condition / Pregnancy: consult with your physician as to whether or not you can work in the lab.

I have read and understood the above safety rules *and* I agree to abide by them.
A copy of the safety rules are in the lab manual.

PRINT Name: _____

Signature: _____ Date: _____

Physical Sciences *Laboratory Technician* Safety Training

Training Procedure

The Lab Director will give a tour of all physics and chemistry labs including the stockrooms. The tour will include location of all safety features.

Personal Safety

- Must wear safety goggles at all times during an experiment or preparations of any solution.
- Wear long pants, like blue jeans. NO SHORTS allowed. Wear shirts with long sleeves in which the sleeves are close fitting and do not "hang" (a lab coat may be worn instead).
- Wear shoes that cover the entire foot—sandals with socks are not allowed as a substitute!
- NO smoking, eating or drinking in the lab. No smoking in the immediate outside hallway to the lab or to the stockroom.
- Know the location and use of safety features in the stockroom as well as the teaching labs including Wiegand 150, Adrian 104, Adrian 105 NMR room, Adrian 106, NHS 116, NHS 216, and W234.

Safety features include safety exits—primary and secondary. Know the location of the nearest Fire Blanket. If there is a fire or suspected fire: follow the "R.A.C.E." acronym : Rescue – Alarm – Contain – Extinguish

Rescue

Immediately stop what you are doing and remove anyone in immediate danger from the fire to a safe area.

Alarm

Activate the nearest fire alarm pull stations (if applicable).

Call 911 (dial 9 and then 9-1-1 when using campus phone) to report the location and current extent of the fire.

Contain

Close all doors and windows that you can safety reach to contain the fire.

During evacuation close the doors behind you.

Extinguish

Attempt to extinguish the fire ONLY if it is safe to do so.

They will follow the "P.A.S.S." procedure:

P = Pull the pin breaking the plastic seal

A = Aim at the <u>base</u> of the fire

S = Squeeze the handles together

S = Sweep from side to side.

Eyewash and shower stations: person should rinse for at least 15 minutes with water. Check Safety Data Sheets for First Aid measures, in case rinsing requires a longer period of time.

First aid kits: No matter how small the injury, an Incident Report form should be filled out and forwarded to the Lab Director.

Chemical spill kits: know their location and general usage.

- In case of an emergency, important phone numbers
  (These numbers are also posted by the phones in the Physical Sciences labs)
  Student Health Services: Landon 104, x-3750.
  Fire Alarm: dial 9 and then 9-1-1 9 (when dialing from a campus phone)
  Campus Security: x-3333
  Florida Poison Center: dial 9 and then 800-282-3171
  Physical Sciences
  Lab Director: x-3434
  Chairperson: Dr. Zajickova, x-3238

- Incident Report Forms—if there is any type of accident in the lab (or any case that involves calling Student Health Center or 911), then you must fill out an Incident Report Form and submit it to the Lab Director.

- If you must smell a chemical, then use an "indirect" technique such as wafting.

- Mouth pipetting is not allowed. Use pipette bulbs.

Safe Disposal of Hazardous Materials

- Hazardous waste does not go down the drain (sink). Place in an appropriate, labeled container which includes the words Using ink, the words "Hazardous Waste" should appear on the container followed by the list of chemicals inside that container. The chemical names must be written—no chemical formulas or abbreviations. Once the container is deemed "full", either transfer the container to the chemical stockroom and/or notify the lab director.

- All broken glassware (except mercury thermometers) goes in the blue and white cardboard box.

- Broken mercury thermometers should be taped and left aside while the spilt mercury is placed in a mercury waste container.

- Any spilled chemical must be taken care of immediately. Contact the lab director for assistance.

- Wash your hands thoroughly with soap and water when you have finished working in a lab or stockroom.

Right to Know

You have the right to request information on the chemicals that you are working with or being exposed to in the lab or stockroom. The information may be found in the SDS (Safety Data Sheet) located in Wiegand 121.

Medical Condition

If you are pregnant or have a medical condition that might be affected from working with chemicals, then consult your physician as to whether or not you may work in the lab.

Clean-up

At the end of a lab session, do the following checks….

- Cap all reagent bottles tightly and return to designated lab bench.
- Close all containers located in the fume hood. Clean any spills.
- Turn off and unplug from electrical outlets all hot plates, melting point apparatus, etc.
- Gas valves must be completely closed.
- Turn off lights and lock all doors to the lab.

Tardiness/Absence

Show up to work on time. If for whatever reason you cannot show up to work or will be late, then please notify the lab director (call or send an e-mail).

You may work only during your scheduled hours under the supervision of the lab director or chairperson.

The lab director has gone over the safety rules as listed on pages one and two and has shown the location of safety features in the labs as well as in the stockroom.

I agree to uphold the above duties and follow the safety rules as described. If I have any questions, then I will ask the lab director for assistance.

Print name: _____

Signature: _____ Date: _____

Chemistry Research Students

CHE 395/495 Safety Guidelines

As a student pursuing research, you have a right to know and an obligation to follow proper safety procedures while in the laboratory. By signing below, you are indicating that you have been instructed on the proper safety procedures to be followed in the research lab, have understood these instructions and agree to abide by them.

1. **Informed on the "Right to Know" policy and the location of the SDS sheets**.
   Right to Know—each individual has the right to know about the chemicals to which they may be exposed.
   SDS—Safety Data Sheets are located in Wiegand 121—should be consulted once working with unfamiliar chemicals.

2. **Advised of proper chemical handling, storage and disposal procedures in the lab**.
   - ANY chemicals MUST be handled in the fume hood.
   - Pay extreme caution to material labels and be familiar with their meaning.
   - Label secondary containers with the name of the chemical(s) and hazard warnings.
   - Store chemicals based on compatibility.
   - Return all chemicals to proper storage location before leaving the laboratory.
   - Dispose chemical waste into a properly labeled waste container.
   - Do not hesitate to consult your supervisor if any uncertainty arises as to the correct procedure for waste disposal.
   - Decontaminate and dispose of biohazardous waste in the Biohazardous waste container.
   - When working with biohazardous materials, decontaminate work surfaces and instruments with 1:10 solution of bleach and wash hands thoroughly with an effective detergent.
   - If work is performed with animal or human tissues, vaccination against heptatitis B is recommended.

3. **Advised and trained of the location and proper use of safety features in the labs**.
   - Safety features include—fire blanket, fire extinguisher, eye wash station, emergency shower, phone, fire exits, emergency phone numbers, and first aid kit.
   - Report an injury, no matter how minor, to your professor. In case of serious injury, a nurse is located in Landon 104, x-3750; security can be reached at x-3333 or dial 911.

4. **Informed of proper attire to be worn in the lab**.
   - Wear safety goggles at all times in the lab, even if the experiments are not being performed.
   - Wear long pants, lab coat, and shoes without open toes.
   - Wear gloves when handling chemicals.

5. **Advised on professional laboratory behavior**.
   - Drinking, eating, and smoking is not allowed in the lab.

- Used glassware must be washed, dried and returned to storage location before leaving the laboratory.
- Students not conducting research are not allowed in the laboratory.
- Personal belongings must be placed in the designated area only.

6. **Advised on asking the research supervisor or qualified person any questions about proper lab procedures**.
    - NEVER work alone in the lab, always make sure that your supervisor or qualified person is present.
    - Take special care at all times to follow the advice and instructions of your supervisor.
    - If in doubt about the proper chemical handling STOP work immediately and contact your supervisor.

7. **Advised on refreshing the safety guidelines once a year**.

_____
Student's Name (Please Print)

_____ _____
Signature of Student Date

_____ _____
Signature of Instructor Date

Appendix C-3: Lab Safety Training
College of Health Sciences

- **Hold Harmless Agreement Form**

HOLD HARMLESS AGREEMENT FOR BARRY UNIVERSITY'S COLLEGE OF HEALTH SCIENCES AND LABORATORIES

I HEREBY ACKNOWLEDGE AND AGREE that my participation in classes, activities and open labs organized and sponsored by Barry University's College of Health Sciences DARPA Grant Research Project may carry with it certain inherent risks, including those normally associated with laboratory equipment and materials that may cause bodily harm if improperly used. All participants in the laboratory setting are informed of the potential hazards to which they may be exposed while in the laboratory, as well as the appropriate precautions to protect themselves. This information may be provided by signage, instruction, discussion, or other means.

In consideration of my participation in laboratory activities, I, the undersigned, on behalf of myself, my heirs, representatives, executors, administrators and assigns, do hereby release, indemnify, and hold harmless Barry University their Trustees, officers, agents, and employees from any cause of action, claims, or demands of any nature whatsoever, which I, my heirs, representatives, executors, administrators and assigns may now have, or have in the future against Barry University on account of personal injury, property damage, death or accident of any kind, arising out of or in any way related to my participation in Barry University's College of Health Sciences DARPA Grant Research Project, whether that participation is supervised or unsupervised, howsoever the injury or damage is caused, other than those injuries resulting from the sole negligence of Barry University.

I certify that I am in good health and that I have no physical limitations that would preclude my safe participation in these educational activities.

I further certify that I am therefore of lawful age (18 years or older) and otherwise legally competent to sign this agreement. I understand that the terms of this agreement are legally binding and I certify that I am carefully signing this agreement, after having carefully read same, of my own free will.

_____ _____

Signature of Student/Participant Date

_____

Print Name

In the case of an emergency please leave the contact information of whom we may contact

Name:_____ Phone:_____

Address:_____

The following topics have been reviewed with the student. (Place a check covered)

1. ☐ Review of specific research and training being conducted in the laboratory
2. ☐ Explanation and Reinforcement of Barry University laboratory safety requirements i.e., review of hazardous materials utilized in a laboratory setting (Biological, Chemical, Physical)
3. ☐ Instruction on known symptoms associated with exposure to highly toxic chemicals or infectious agents used in the laboratory
4. ☐ Review of the laboratory Chemical Hygiene Plan and all Standard Operating Procedures
5. ☐ Location of Material Safety Data Sheets and instructions on use
6. ☐ Location of Protective Equipment and demonstrated use (Eye Protection, Footwear, Gloves, Laboratory Coat, Surgical Mask, Biological Safety Cabinet, Fume Hood)
7. ☐ Review of emergency procedures for: building evacuation, sheltering-in/gathering-in, personal injury, and spills of hazardous materials
8. ☐ Identification of emergency equipment locations and procedures (emergency eyewash, emergency shower, fire alarm pull station, fire extinguisher, telephone, etc.)
9. ☐ Location of waste disposal areas and knowledge of waste disposal procedures for tissue specimens, bio-hazardous materials, chemicals, sharps/broken glass
10. ☐ Review of laboratory signage system as indicated on laboratory door and wall posting
11. ☐ Familiarity with Barry University safety manuals (Laboratory Safety Guidelines, Chemical Hygiene Plan, Radiation Safety Manual, and Bio-Safety Manual)

Comment [EM1]: Do we have manuals of this kind?

_____ _____

Signature of Student/Participant Date

_____ _____

Signature of Laboratory Supervisor Date

_____ _____

Signature of AHPP Program Director Date

Appendix C-4: Lab Safety Training
School of Podiatric Medicine

- **Lab Safety Rules**
- **Pledge of Respect, Anatomical Board of the State of Florida**

RULES OF THE LAB:

1) **Respect must be shown to the cadavers at all times. No crude jokes in the lab will be tolerated.**

2) **Human remains must be properly handled and stored.**
   a) **Gloves are to be worn when handling cadaver materials.**
   b) **All fat remains must be placed in the bucket below dissecting tables.**
   c) **Cadavers must be kept moist with preservative solution at all times. An area may appear moist due to the nature of the cadaver, but that is not sufficient.**
   d) **Cadavers must be inspected for any signs of mold.**
   e) **Spray any area that appears dry.**
   f) **Any sign of mold must be reported to the instructor at once!**

3) **Students must be properly dressed and prepared to dissect when entering the lab.**
   a) **Enclosed shoes, lab coat, and, or scrubs (matching top AND pants) must be worn at all times.**
   b) **All head-coverings (hats, caps, bandanas, etc.) must be removed during lab time. Head attire for religious reasons is permitted.**
   c) **Long hair must be held back by a discrete object.**

4) **Students are not allowed to bring visitors into the lab without permission from the course director.**

5) **No cameras or other image capturing devices are allowed in the anatomy lab.**

6) **No food or drink material are permitted in the lab.**

7) **Students are not allowed to be in the lab without an assigned Teaching Assistant or Instructor present.**

8) **Students are responsible for leaving the lab in clean condition.**

These rules must be adhered to.

Any student showing disrespectful behavior in the lab will be asked to leave the lab and be reported to his or her advisor for disciplinary actions, such as refusal of admittance to the laboratory.

BiBi Singh, DPM
Assistant Professor of Anatomy
Anatomy Lab Director

I have read and understand the rules of the lab_____.

Print name_____

August 27, 2012

ANATOMICAL BOARD OF THE
STATE OF FLORIDA

University of Florida
College of Medicine
PO Box 100235
Gainesville, Florida 32610-0235
Telephone: 352-392-3588
1-800-628-2594

Pledge of Respect

Policies and Procedures Applicable to _____
Students and Residents/Fellows

Once a donated human anatomical specimen is made accessible to a faculty member of The _____, the responsibility for the security and proper storage of the human anatomical specimen is that of the faculty member and the faculty member's program. Consonant with this responsibility, every student and resident having access to human anatomical specimens under the supervision of the faculty member will be required to sign the following pledge prior to having access to a donated human anatomical specimen provided by the Anatomical Board:

Pledge of Respect for the Sanctity of Donated Human Anatomical Specimens

I, the undersigned student, resident or fellow, recognize that the bequest of human remains to the Anatomical Board of the State of Florida represents a direct and important contribution to medical teaching and research. Such donations allow health professional faculty and students the opportunity to closely examine, evaluate, and understand the detailed structure of the human body. Further, the caring and thoughtfulness of such bequests provides physicians and research scientists with the opportunity to gain knowledge that may prolong, improve, or save someone's life. Without such bequests, medical science and health care would suffer devastating setbacks.

In recognition of the generosity of such bequests, I understand that the policy of the Anatomical Board of the State of Florida is to treat donated human anatomical specimens with the utmost respect and gratitude at all times, and I pledge to comply with this policy. I acknowledge that NO PHOTOGRAPHY of any part of any human specimen is permitted without permission from the Executive Director of the Anatomical Board. I further pledge that the donated human anatomical specimens to which I have access will remain in specific teaching/research rooms or storage space approved for such use by the Anatomical Board, unless

a signed authorization for transfer elsewhere has been executed by the Executive Director of the Anatomical Board of the State of Florida or his/her authorized designee. I further pledge to comply with all applicable requirements for timely return of human anatomical specimens to the Anatomical Board of the State of Florida.

_____ _____
Signature Date

Typed or Printed Name: _____
Title: _____
Department/College: _____

Miami Office:
University of Miami
School of Medicine
Department of Anatomy - R124
PO Box 016960
Miami, FL 33101-6960
Telephone: 305-243-6691

Tampa Office:
University of South Florida
College of Medicine
Department of Anatomy, MDC-006
12901 Bruce B. Downs Blvd.
Tampa, FL 33612-4799
Telephone: 813-974-2843

Tallahassee Office:
Florida State University
College of Medicine
Tallahassee, FL
32306-4300
Telephone: 850-644-7501

EQUAL OPPORTUNITY / AFFIRMATIVE ACTION EMPLOYER

Form last modified November 4, 2003

Appendix D: Incident Report Form

Barry University
Laboratory Incident Report Form (Minor Incidents Only)

THIS FORM IS TO BE USED WHEN THE FIRST AID KIT IS USED AND IS FOR MINOR INCIDENTS ONLY. FOR EMERGENCY MEDICAL CARE, CALL 911 FIRST AND THEN PUBLIC SAFETY AT x3333.

Name of Injured Person: _____

Status (Check One): _____Student: _____ Instructor: _____Other_____(Specify)

Name of Lab instructor: _____

Date of incident: _____; Time of Incident: _____

Building & Room number: _____; Course number & section: _____

Description of Injury / Incident:_____
_____
_____
_____
_____

Action Taken/Resolution:_____
_____
_____
_____

☐ **For major, life-threatening injury**, 911 and Public Safety were called

☐ **For minor injuries received by student**, please check one of the following:

- ☐ Student **agreed** to go to the Student Health Center for evaluation and treatment.
- ☐ Student **refused** to go to the Student Health Center for evaluation and treatment.

☐ **For injuries received by employee**, report was made to Human Resources.

Report Prepared by_____ ; Date_____

Laboratory Instructor's Signature_____; Date_____

Injured Person's Signature_____; Date_____

SUBMIT TO LABORATORY DIRECTOR;
LABORATORY DIRECTOR—SUBMIT COPY TO PUBLIC SAFETY DEPARTMENT

Appendix E: Exposure Assessment, Formaldehyde

- **OSHA 29CFR 1910.1048 App A**
  Substance Technical Guidelines for Formalin

- **OSHA 29CFR 1910.1048 App B**
  Sampling Strategy and Analytical Methods for Formaldehyde

UNITED STATES
DEPARTMENT OF LABOR

• **Part Number:**	**1910**
• **Part Title:**	**Occupational Safety and Health Standards**
• **Subpart:**	**Z**
• **Subpart Title:**	**Toxic and Hazardous Substances**
• **Standard Number:**	**1910.1048 App A**
• **Title:**	**Substance technical guidelines for formalin**

The following Substance Technical Guideline for Formalin provides information on uninhibited formalin solution (37 percent formaldehyde, no methanol stabilizer). It is designed to inform employees at the production level of their rights and duties under the formaldehyde standard whether their job title defines them as workers or supervisors. Much of the information provided is general; however, some information is specific for formalin. When employee exposure to formaldehyde is from resins capable of releasing formaldehyde, the resin itself and other impurities or decomposition products may also be toxic, and employers should include this information as well when informing employees of the hazards associated with the materials they handle. The precise hazards associated with exposure to formaldehyde depend both on the form (solid, liquid, or gas) of the material and the concentration of formaldehyde present. For example, 37-50 percent solutions of formaldehyde present a much greater hazard to the skin and eyes from spills or splashes than solutions containing less than 1 percent formaldehyde. Individual Substance Technical Guidelines used by the employer for training employees should be modified to properly give information on the material actually being used.

Substance Identification
Chemical Name: Formaldehyde
Chemical Family: Aldehyde
Chemical Formula: HCHO
Molecular Weight: 30.03
Chemical Abstracts Service Number (CAS Number): 50-00-0

Synonyms: Formalin; Formic Aldehyde; Paraform; Formol; Formalin (Methanol-free); Fyde; Formalith; Methanal; Methyl Aldehyde; Methylene Glycol; Methylene Oxide; Tetraoxymethalene; Oxomethane; Oxymethylene

Components and Contaminants
Percent: 37.0 Formaldehyde
Percent: 63.0 Water

(Note.-Inhibited solutions contain methanol.)

Other Contaminants: Formic acid (alcohol free) Exposure Limits:

OSHA TWA-1 ppm
OSHA STEL-2 ppm

Physical Data
Description: Colorless liquid, pungent odor
Boiling point: 214 deg. F (101 deg. C)

Specific Gravity: 1.08 (H(2)O=1 at 20 deg. C)
pH: 2.8-4.0
Solubility in Water: Miscible
Solvent Solubility: Soluble in alcohol and acetone
Vapor Density: 1.04 (Air=1 at 20 deg. C)
Odor Threshold: 0.8-1 ppm

Fire and Explosion Hazard

Moderate fire and explosion hazard when exposed to heat or flame.

The flash point of 37 percent formaldehyde solutions is above normal room temperature, but the explosion range is very wide, from 7 to 73 percent by volume in air.

Reaction of formaldehyde with nitrogen dioxide, nitromethane, perchloric acid and aniline, or peroxyformic acid yields explosive compounds.

Flash Point: 185 deg. F (85 deg. C) closed cup
Lower Explosion Limit: 7 percent
Upper Explosion Limit: 73 percent
Autoignition Temperature: 806 deg. F (430 deg. C)
Flammability (OSHA): Category 4 flammable liquid

Extinguishing Media: Use dry chemical, "alcohol foam", carbon dioxide, or water in flooding amounts as fog. Solid streams may not be effective. Cool fire-exposed containers with water from side until well after fire is out.

Use of water spray to flush spills can also dilute the spill to produce nonflammable mixtures. Water runoff, however, should be contained for treatment.

National Fire Protection Association Section 325M Designation:

Health: 2-Materials hazardous to health, but areas may be entered with full-faced mask self-contained breathing apparatus which provides eye protection.

Flammability: 2-Materials which must be moderately heated before ignition will occur. Water spray may be used to extinguish the fire because the material can be cooled below its flash point.

Reactivity: D-Materials which (in themselves) are normally stable even under fire exposure conditions and which are not reactive with water. Normal fire fighting procedures may be used.

Reactivity

Stability: Formaldehyde solutions may self-polymerize to form paraformaldehyde which precipitates.

Incompatibility (Materials to Avoid): Strong oxidizing agents, caustics, strong alkalies, isocyanates, anhydrides, oxides, and inorganic acids. Formaldehyde reacts with hydrochloric acid to form the potent carcinogen, bis-chloromethyl ether. Formaldehyde reacts with nitrogen dioxide, nitromethane, perchloric acid and aniline, or peroxyformic acid to yield explosive compounds. A violent reaction occurs when formaldehyde is mixed with strong oxidizers.

Hazardous Combustion or Decomposition Products: Oxygen from the air can oxidize formaldehyde to formic acid, especially when heated. Formic acid is corrosive.

Health Hazard Data

Acute Effects of Exposure

Ingestion (Swallowing): Liquids containing 10 to 40 percent formaldehyde cause severe irritation and inflammation of the mouth, throat, and stomach. Severe stomach pains will follow ingestion with possible loss of consciousness and death. Ingestion of dilute formaldehyde solutions (0.03-0.04 percent) may cause discomfort in the stomach and pharynx.

Inhalation (Breathing): Formaldehyde is highly irritating to the upper respiratory tract and eyes. Concentrations of 0.5 to 2.0 ppm may irritate the eyes, nose, and throat of some individuals. Concentrations of 3 to 5 ppm also cause tearing of the eyes and are intolerable to some persons. Concentrations of 10 to 20 ppm cause difficulty in breathing, burning of the nose and throat, cough, and heavy tearing of the eyes, and 25 to 30 ppm causes severe respiratory tract injury leading to pulmonary edema and pneumonitis. A concentration of 100 ppm is immediately dangerous to life and health. Deaths from accidental exposure to high concentrations of formaldehyde have been reported.

Skin (Dermal): Formalin is a severe skin irritant and a sensitizer. Contact with formalin causes white discoloration, smarting, drying, cracking, and scaling. Prolonged and repeated contact can cause numbness and a hardening or tanning of the skin. Previously exposed persons may react to future exposure with an allergic eczematous dermatitis or hives.

Eye Contact: Formaldehyde solutions splashed in the eye can cause injuries ranging from transient discomfort to severe, permanent corneal clouding and loss of vision. The severity of the effect depends on the concentration of formaldehyde in the solution and whether or not the eyes are flushed with water immediately after the accident.

Note.-The perception of formaldehyde by odor and eye irritation becomes less sensitive with time as one adapts to formaldehyde. This can lead to overexposure if a worker is relying on formaldehyde's warning properties to alert him or her to the potential for exposure.

Acute Animal Toxicity:
Oral, rats: LD50=800 mg/kg
Oral, mouse: LD50=42 mg/kg
Inhalation, rats: LCLo=250 mg/kg
Inhalation, mouse: LCLo=900 mg/kg
Inhalation, rats: LC50=590 mg/kg

Chronic Effects of Exposure

Carcinogenicity: Formaldehyde has the potential to cause cancer in humans. Repeated and prolonged exposure increases the risk. Various animal experiments have conclusively shown formaldehyde to be a carcinogen in rats. In humans, formaldehyde exposure has been associated with cancers of the lung, nasopharynx and oropharynx, and nasal passages.

Mutagenicity: Formaldehyde is genotoxic in several in vitro test systems showing properties of both an initiator and a promoter.

Toxicity: Prolonged or repeated exposure to formaldehyde may result in respiratory impairment. Rats exposed to formaldehyde at 2 ppm developed benign nasal tumors and changes of the cell structure in the nose as well as inflamed mucous membranes of

the nose. Structural changes in the epithelial cells in the human nose have also been observed. Some persons have developed asthma or bronchitis following exposure to formaldehyde, most often as the result of an accidental spill involving a single exposure to a high concentration of formaldehyde.

Emergency and First Aid Procedures

Ingestion (Swallowing): If the victim is conscious, dilute, inactivate, or absorb the ingested formaldehyde by giving milk, activated charcoal, or water. Any organic material will inactivate formaldehyde. Keep affected person warm and at rest. Get medical attention immediately. If vomiting occurs, keep head lower than hips.

Inhalation (Breathing): Remove the victim from the exposure area to fresh air immediately. Where the formaldehyde concentration may be very high, each rescuer must put on a self-contained breathing apparatus before attempting to remove the victim, and medical personnel should be informed of the formaldehyde exposure immediately. If breathing has stopped, give artificial respiration. Keep the affected person warm and at rest. Qualified first-aid or medical personnel should administer oxygen, if available, and maintain the patient's airways and blood pressure until the victim can be transported to a medical facility. If exposure results in a highly irritated upper respiratory tract and coughing continues for more than 10 minutes, the worker should be hospitalized for observation and treatment.

Skin Contact: Remove contaminated clothing (including shoes) immediately. Wash the affected area of your body with soap or mild detergent and large amounts of water until no evidence of the chemical remains (at least 15 to 20 minutes). If there are chemical burns, get first aid to cover the area with sterile, dry dressing, and bandages. Get medical attention if you experience appreciable eye or respiratory irritation.

Eye Contact: Wash the eyes immediately with large amounts of water occasionally lifting lower and upper lids, until no evidence of chemical remains (at least 15 to 20 minutes). In case of burns, apply sterile bandages loosely without medication. Get medical attention immediately. If you have experienced appreciable eye irritation from a splash or excessive exposure, you should be referred promptly to an opthamologist for evaluation.

Emergency Procedures

Emergencies: If you work in an area where a large amount of formaldehyde could be released in an accident or from equipment failure, your employer must develop procedures to be followed in event of an emergency. You should be trained in your specific duties in the event of an emergency, and it is important that you clearly understand these duties. Emergency equipment must be accessible and you should be trained to use any equipment that you might need. Formaldehyde contaminated equipment must be cleaned before reuse.

If a spill of appreciable quantity occurs, leave the area quickly unless you have specific emergency duties. Do not touch spilled material. Designated persons may stop the leak and shut off ignition sources if these procedures can be done without risk. Designated persons should isolate the hazard area and deny entry except for necessary people protected by suitable protective clothing and respirators adequate for the exposure. Use water spray to reduce vapors. Do not smoke, and prohibit all flames or flares in the hazard area.

Special Firefighting Procedures: Learn procedures and responsibilities in the event of a fire in your workplace. Become familiar with the appropriate equipment and supplies and their location. In firefighting, withdraw immediately in case of rising sound from venting safety device or any discoloration of storage tank due to fire.

Spill, Leak, and Disposal Procedures

Occupational Spill: For small containers, place the leaking container in a well- ventilated area. Take up small spills with absorbent material and place the waste into properly labeled containers for later disposal. For larger spills, dike the spill to minimize contamination and facilitate salvage or disposal. You may be able to neutralize the spill with sodium hydroxide or sodium sulfite. Your employer must comply with EPA rules regarding the clean-up of toxic waste and notify state and local authorities, if required. If the spill is greater than 1,000 lb/day, it is reportable under EPA's Superfund legislation.

Waste Disposal: Your employer must dispose of waste containing formaldehyde in accordance with applicable local, state, and Federal law and in a manner that minimizes exposure of employees at the site and of the clean-up crew.

Monitoring and Measurement Procedures

Monitoring Requirements: If your exposure to formaldehyde exceeds the 0.5 ppm action level or the 2 ppm STEL, your employer must monitor your exposure. Your employer need not measure every exposure if a "high exposure" employee can be identified. This person usually spends the greatest amount of time nearest the process equipment. If you are a "representative employee", you will be asked to wear a sampling device to collect formaldehyde. This device may be a passive badge, a sorbent tube attached to a pump, or an impinger containing liquid. You should perform your work as usual, but inform the person who is conducting the monitoring of any difficulties you are having wearing the device.

Evaluation of 8-hour Exposure: Measurements taken for the purpose of determining time-weighted average (TWA) exposures are best taken with samples covering the full shift. Samples collected must be taken from the employee's breathing zone air.

Short-term Exposure Evaluation: If there are tasks that involve brief but intense exposure to formaldehyde, employee exposure must be measured to assure compliance with the STEL. Sample collections are for brief periods, only 15 minutes, but several samples may be needed to identify the peak exposure.

Monitoring Techniques: OSHA's only requirement for selecting a method for sampling and analysis is that the methods used accurately evaluate the concentration of formaldehyde in employees' breathing zones. Sampling and analysis may be performed by collection of formaldehyde on liquid or solid sorbents with subsequent chemical analysis. Sampling and analysis may also be performed by passive diffusion monitors and short-term exposure may be measured by instruments such as real-time continuous monitoring systems and portable direct reading instruments.

Notification of Results: Your employer must inform you of the results of exposure monitoring representative of your job. You may be informed in writing, but posting the results where you have ready access to them constitutes compliance with the standard.

Protective Equipment and Clothing

[Material impervious to formaldehyde is needed if the employee handles formaldehyde solutions of 1 percent or more. Other employees may also require protective clothing or equipment to prevent dermatitis.]

Respiratory Protection: Use NIOSH-approved full facepiece negative pressure respirators equipped with approved cartridges or canisters within the use limitations of these devices. (Present restrictions on cartridges and canisters do not permit them to be used for a full workshift.) In all other situations, use positive pressure respirators such as the positive-pressure air purifying respirator or the self-contained breathing apparatus (SCBA). If you use a negative pressure respirator, your employer must provide you with fit testing of the respirator at least once a year.

Protective Gloves: Wear protective (impervious) gloves provided by your employer, at no cost, to prevent contact with formalin. Your employer should select these gloves based on the results of permeation testing and in accordance with the ACGIH

Guidelines for Selection of Chemical Protective Clothing.

Eye Protection: If you might be splashed in the eyes with formalin, it is essential that you wear goggles or some other type of complete protection for the eye. You may also need a face shield if your face is likely to be splashed with formalin, but you must not substitute face shields for eye protection. (This section pertains to formaldehyde solutions of 1 percent or more.)

Other Protective Equipment: You must wear protective (impervious) clothing and equipment provided by your employer at no cost to prevent repeated or prolonged contact with formaldehyde liquids. If you are required to change into whole-body chemical protective clothing, your employer must provide a change room for your privacy and for storage of your normal clothing.

If you are splashed with formaldehyde, use the emergency showers and eyewash fountains provided by your employer immediately to prevent serious injury. Report the incident to your supervisor and obtain necessary medical support.

Entry Into an IDLH Atmosphere

Enter areas where the formaldehyde concentration might be 100 ppm or more only with complete body protection including a self-contained breathing apparatus with a full facepiece operated in a positive pressure mode or a supplied air respirator with full facepiece and operated in a positive pressure mode. This equipment is essential to protect your life and health under such extreme conditions.

Engineering Controls

Ventilation is the most widely applied engineering control method for reducing the concentration of airborne substances in the breathing zones of workers. There are two distinct types of ventilation.

Local Exhaust: Local exhaust ventilation is designed to capture airborne contaminants as near to the point of generation as possible. To protect you, the direction of contaminant flow must always be toward the local exhaust system inlet and away from you.

General (Mechanical): General dilution ventilation involves continuous introduction of fresh air into the workroom to mix with the contaminated air and lower your breathing zone concentration of formaldehyde. Effectiveness depends on the number of air changes per hour. Where devices emitting formaldehyde are spread out over a large area, general dilution ventilation may be the only practical method of control.

Work Practices: Work practices and administrative procedures are an important part of a control system. If you are asked to perform a task in a certain manner to limit your exposure to formaldehyde, it is extremely important that you follow these procedures.

Medical Surveillance

Medical surveillance helps to protect employees' health. You are encouraged strongly to participate in the medical surveillance program.

Your employer must make a medical surveillance program available at no expense to you and at a reasonable time and place if you are exposed to formaldehyde at concentrations above 0.5 ppm as an 8-hour average or 2 ppm over any 15-minute period. You will be offered medical surveillance at the time of your initial assignment and once a year afterward as long as your exposure is at least 0.5 ppm (TWA) or 2 ppm (STEL). Even if your exposure is below these levels, you should inform your employer if you have signs and symptoms that you suspect, through your training, are related to your formaldehyde exposure because you may

need medical surveillance to determine if your health is being impaired by your exposure.

The surveillance plan includes:

(a) A medical disease questionnaire.

(b) A physical examination if the physician determines this is necessary.

If you are required to wear a respirator, your employer must offer you a physical examination and a pulmonary function test every year.

The physician must collect all information needed to determine if you are at increased risk from your exposure to formaldehyde. At the physician's discretion, the medical examination may include other tests, such as a chest x-ray, to make this determination.

After a medical examination the physician will provide your employer with a written opinion which includes any special protective measures recommended and any restrictions on your exposure. The physician must inform you of any medical conditions you have which would be aggravated by exposure to formaldehyde.

All records from your medical examinations, including disease surveys, must be retained at your employer's expense.

Emergencies

If you are exposed to formaldehyde in an emergency and develop signs or symptoms associated with acute toxicity from formaldehyde exposure, your employer must provide you with a medical examination as soon as possible. This medical examination will include all steps necessary to stabilize your health. You may be kept in the hospital for observation if your symptoms are severe to ensure that any delayed effects are recognized and treated.

[71 FR 16673, April 3, 2006; 78 FR 9313, Feb. 8, 2013]

UNITED STATES
DEPARTMENT OF LABOR

• **Part Number:**	**1910**
• **Part Title:**	**Occupational Safety and Health Standards**
• **Subpart:**	**Z**
• **Subpart Title:**	**Toxic and Hazardous Substances**
• **Standard Number:**	**1910.1048 App B**
• **Title:**	**Sampling strategy and analytical methods for formaldehyde**

To protect the health of employees, exposure measurements must be unbiased and representative of employee exposure. The proper measurement of employee exposure requires more than a token commitment on the part of the employer. OSHA's mandatory requirements establish a baseline; under the best of circumstances all questions regarding employee exposure will be answered. Many employers, however, will wish to conduct more extensive monitoring before undertaking expensive commitments, such as engineering controls, to assure that the modifications are truly necessary. The following sampling strategy, which was developed at NIOSH by Nelson A. Leidel, Kenneth A. Busch, and Jeremiah R. Lynch and described in NIOSH publication No. 77-173 (Occupational Exposure Sampling Strategy Manual) will assist the employer in developing a strategy for determining the exposure of his or her employees.

There is no one correct way to determine employee exposure. Obviously, measuring the exposure of every employee exposed to formaldehyde will provide the most information on any given day. Where few employees are exposed, this may be a practical solution. For most employers, however, use of the following strategy will give just as much information at less cost.

Exposure data collected on a single day will not automatically guarantee the employer that his or her workplace is always in compliance with the formaldehyde standard. This does not imply, however, that it is impossible for an employer to be sure that his or her worksite is in compliance with the standard. Indeed, a properly designed sampling strategy showing that all employees are exposed below the PELs, at least with a 95 percent certainty, is compelling evidence that the exposure limits are being achieved provided that measurements are conducted using valid sampling strategy and approved analytical methods.

There are two PELs, the TWA concentration and the STEL. Most employers will find that one of these two limits is more critical in the control of their operations, and OSHA expects that the employer will concentrate monitoring efforts on the critical component. If the more difficult exposure is controlled, this information, along with calculations to support the assumptions, should be adequate to show that the other exposure limit is also being achieved.

Sampling Strategy

Determination of the Need for Exposure Measurements

The employer must determine whether employees may be exposed to concentrations in excess of the action level. This determination becomes the first step in an employee exposure monitoring program that minimizes employer sampling burdens while providing adequate employee protection. If employees may be exposed above the action level, the employer must measure exposure. Otherwise, an objective determination that employee exposure is low provides adequate evidence that exposure potential has been examined.

The employer should examine all available relevant information, eg. insurance company and trade association data and information from suppliers or exposure data collected from similar operations. The employer may also use previously-conducted sampling including area monitoring. The employer must make a determination relevant to each operation

although this need not be on a separate piece of paper. If the employer can demonstrate conclusively that no employee is exposed above the action level or the STEL through the use of objective data, the employer need proceed no further on employee exposure monitoring until such time that conditions have changed and the determination is no longer valid.
If the employer cannot determine that employee exposure is less than the action level and the STEL, employee exposure monitoring will have to be conducted.

Workplace Material Survey
The primary purpose of a survey of raw material is to determine if formaldehyde is being used in the work environment and if so, the conditions under which formaldehyde is being used.
The first step is to tabulate all situations where formaldehyde is used in a manner such that it may be released into the workplace atmosphere or contaminate the skin. This information should be available through analysis of company records and information on the MSDSs available through provisions of this standard and the Hazard Communication standard.

If there is an indication from materials handling records and accompanying MSDSs that formaldehyde is being used in the following types of processes or work operations, there may be a potential for releasing formaldehyde into the workplace atmosphere:
(1) Any operation that involves grinding, sanding, sawing, cutting, crushing, screening, sieving, or any other manipulation of material that generates formaldehyde-bearing dust
(2) Any processes where there have been employee complaints or symptoms indicative of exposure to formaldehyde
(3) Any liquid or spray process involving formaldehyde
(4) Any process that uses formaldehyde in preserved tissue
(5) Any process that involves the heating of a formaldehyde-bearing resin. Processes and work operations that use formaldehyde in these manners will probably require further investigation at the worksite to determine the extent of employee monitoring that should be conducted.

Workplace Observations
To this point, the only intention has been to provide an indication as to the existence of potentially exposed employees. With this information, a visit to the workplace is needed to observe work operations, to identify potential health hazards, and to determine whether any employees may be exposed to hazardous concentrations of formaldehyde.
In many circumstances, sources of formaldehyde can be identified through the sense of smell. However, this method of detection should be used with caution because of olfactory fatigue.

Employee location in relation to source of formaldehyde is important in determining if an employee may be significantly exposed to formaldehyde. In most instances, the closer a worker is to the source, the higher the probability that a significant exposure will occur.
Other characteristics should be considered. Certain high temperature operations give rise to higher evaporation rates. Locations of open doors and windows provide natural ventilation that tend to dilute formaldehyde emissions. General room ventilation also provides a measure of control.

Calculation of Potential Exposure Concentrations
By knowing the ventilation rate in a workplace and the quantity of formaldehyde generated, the employer may be able to determine by calculation if the PELs might be exceeded. To account for poor mixing of formaldehyde into the entire room, locations of fans and proximity of employees to the work operation, the employer must include a safety factor. If an employee is relatively close to a source, particularly if he or she is located downwind, a safety factor of 100 may be necessary. For other situations, a factor of 10 may be acceptable. If the employer can demonstrate through such calculations that employee exposure does not exceed the action level or the STEL, the employer may use this information as objective data to demonstrate compliance with the standard.

Sampling Strategy
Once the employer determines that there is a possibility of substantial employee exposure to formaldehyde, the employer is obligated to measure employee exposure.
The next step is selection of a maximum risk employee. When there are different processes where employees may be exposed to formaldehyde, a maximum risk employee should be selected for each work operation.

Selection of the maximum risk employee requires professional judgment. The best procedure for selecting the maximum risk employee is to observe employees and select the person closest to the source of formaldehyde. Employee mobility may affect this selection; e.g. if the closest employee is mobile in his tasks, he may not be the maximum risk employee. Air movement patterns and differences in work habits will also affect selection of the maximum risk employee.

When many employees perform essentially the same task, a maximum risk employee cannot be selected. In this circumstance, it is necessary to resort to random sampling of the group of workers. The objective is to select a subgroup of adequate size so that there is a high probability that the random sample will contain at least one worker with high exposure if one exists. The number of persons in the group influences the number that need to be sampled to ensure that at least one individual from the highest 10 percent exposure group is contained in the sample. For example, to have 90 percent confidence in the results, if the group size is 10, nine should be sampled; for 50, only 18 need to be sampled.

If measurement shows exposure to formaldehyde at or above the action level or the STEL, the employer needs to identify all other employees who may be exposed at or above the action level or STEL and measure or otherwise accurately characterize the exposure of these employees.

Whether representative monitoring or random sampling are conducted, the purpose remains the same-to determine if the exposure of any employee is above the action level. If the exposure of the most exposed employee is less than the action level and the STEL, regardless of how the employee is identified, then it is reasonable to assume that measurements of exposure of the other employees in that operation would be below the action level and the STEL.

Exposure Measurements
There is no "best" measurement strategy for all situations. Some elements to consider in developing a strategy are:
(1) Availability and cost of sampling equipment
(2) Availability and cost of analytic facilities
(3) Availability and cost of personnel to take samples
(4) Location of employees and work operations
(5) Intraday and interday variations in the process
(6) Precision and accuracy of sampling and analytic methods, and
(7) Number of samples needed.

Samples taken for determining compliance with the STEL differ from those that measure the TWA concentration in important ways. STEL samples are best taken in a nonrandom fashion using all available knowledge relating to the area, the individual, and the process to obtain samples during periods of maximum expected concentrations. At least three measurements on a shift are generally needed to spot gross errors or mistakes; however, only the highest value represents the STEL.

If an operation remains constant throughout the workshift, a much greater number of samples would need to be taken over the 32 discrete nonoverlapping periods in an 8-hour workshift to verify compliance with a STEL. If employee exposure is truly uniform throughout the workshift, however, an employer in compliance with the 1 ppm TWA would be in compliance with the 2 ppm STEL, and this determination can probably be made using objective data.

Need to Repeat the Monitoring Strategy
Interday and intraday fluctuations in employee exposure are mostly influenced by the physical processes that generate formaldehyde and the work habits of the employee. Hence, in-plant process variations influence the employer's determination of whether or not additional controls need to be imposed. Measurements that employee exposure is low on a day that is not representative of worst conditions may not provide sufficient information to determine whether or not additional engineering controls should be installed to achieve the PELs.

The person responsible for conducting sampling must be aware of systematic changes which will negate the validity of the sampling results. Systematic changes in formaldehyde exposure concentration for an employee can occur due to:
(1) The employee changing patterns of movement in the workplace
(2) Closing of plant doors and windows
(3) Changes in ventilation from season to season
(4) Decreases in ventilation efficiency or abrupt failure of engineering control equipment
(5) Changes in the production process or work habits of the employee. Any of these changes, if they may result in additional exposure that reaches the next level of action (i.e. 0.5 or 1.0 ppm as an 8-hr average or 2 ppm over 15 minutes) require the employer to perform additional monitoring to reassess employee exposure.

A number of methods are suitable for measuring employee exposure to formaldehyde or for characterizing emissions within the worksite. The preamble to this standard describes some methods that have been widely used or subjected to validation testing. A detailed analytical procedure derived from the OSHA Method 52 for acrolein and formaldehyde is presented below for informational purposes.

Inclusion of OSHA's method in this appendix in no way implies that it is the only acceptable way to measure employee exposure to formaldehyde. Other methods that are free from significant interferences and that can determine formaldehyde at the permissible exposure limits within + or - 25 percent of the "true" value at the 95 percent confidence level are also acceptable. Where applicable, the method should also be capable of measuring formaldehyde at the action level to + or - 35 percent of the "true" value with a 95 percent confidence level. OSHA encourages employers to choose methods that will be best for their individual needs. The employer must exercise caution, however, in choosing an appropriate method since some techniques suffer from interferences that are likely to be present in workplaces of certain industry sectors where formaldehyde is used.

OSHA's Analytical Laboratory Method
Method No: 52
Matrix: Air
Target Concentration: 1 ppm (1.2 mg/m(3))
Procedures: Air samples are collected by drawing known volumes of air through sampling tubes containing XAD-2 adsorbent which have been coated with 2-(hydroxymethyl) piperidine. The samples are desorbed with toluene and then analyzed by gas chromatography using a nitrogen selective detector.
Recommended Sampling Rate and Air Volumes: 0.1 L/min and 24 L
Reliable Quantitation Limit:16 ppb (20 ug/m(3))
Standard Error of Estimate at the Target Concentration: 7.3 percent
Status of the Method: A sampling and analytical method that has been subjected to the established evaluation procedures of the Organic Methods Evaluation Branch.
Date: March 1985

1. General Discussion

1.1 Background: The current OSHA method for collecting acrolein vapor recommends the use of activated 13X molecular sieves. The samples must be stored in an ice bath during and after sampling and also they must be analyzed within 48 hours of collection. The current OSHA method for collecting formaldehyde vapor recommends the use of bubblers containing 10 percent methanol in water as the trapping solution.
This work was undertaken to resolve the sample stability problems associated with acrolein and also to eliminate the need to use bubblers to sample formaldehyde. A goal of this work was to develop and/or to evaluate a common sampling and analytical procedure for acrolein and formaldehyde.
NIOSH has developed independent methodologies for acrolein and formaldehyde which recommend the use of reagent-coated adsorbent tubes to collect the aldehydes as stable derivatives. The formaldehyde sampling tubes contain Chromosorb 102 adsorbent coated with N-benzylethanolamine (BEA) which reacts with formaldehyde vapor to form a stable oxazolidine compound. The acrolein sampling tubes contain XAD-2 adsorbent coated with 2-(hydroxymethyl)piperidine (2-HMP) which reacts with acrolein vapor to form a different, stable oxazolidine derivative. Acrolein does not appear to react with BEA to give a suitable reaction product. Therefore, the formaldehyde procedure cannot provide a common method for both aldehydes. However, formaldehyde does react with 2-HMP to form a very suitable reaction product. It is the quantitative reaction of acrolein and formaldehyde with 2-HMP that provides the basis for this evaluation.
This sampling and analytical procedure is very similar to the method recommended by NIOSH for acrolein. Some changes in the NIOSH methodology were necessary to permit the simultaneous determination of both aldehydes and also to accommodate OSHA laboratory equipment and analytical techniques.

1.2 Limit-defining parameters: The analyte air concentrations reported in this method are based on the recommended air volume for each analyte collected separately and a desorption volume of 1 mL. The amounts are presented as acrolein and/or formaldehyde, even though the derivatives are the actual species analyzed.

1.2.1 Detection limits of the analytical procedure: The detection limit of the analytical procedure was 386 pg per injection for formaldehyde. This was the amount of analyte which gave a peak whose height was about five times the height of the peak given by the residual formaldehyde derivative in a typical blank front section of the recommended sampling tube.

1.2.2 Detection limits of the overall procedure: The detection limits of the overall procedure were 482 ng per sample (16 ppb or 20 ug/m(3) for formaldehyde). This was the amount of analyte spiked on the sampling device which allowed recoveries approximately equal to the detection limit of the analytical procedure.

1.2.3 Reliable quantitation limits: The reliable quantitation limit was 482 ng per sample (16 ppb or 20 ug/m(3)) for formaldehyde. These were the smallest amounts of analyte which could be quantitated within the limits of a recovery of at least 75 percent and a precision ((+ or -)(1.96 SD) of + or - 25 percent or better.
The reliable quantitation limit and detection limits reported in the method are based upon optimization of the instrument for the smallest possible amount of analyte. When the target concentration of an exceptionally higher than these limits, they may not be attainable at the routine operating parameters.

1.2.4 Sensitivity: The sensitivity of the analytical procedure over concentration ranges representing 0.4 to 2 times the target concentration, based on the recommended air volumes, was 7,589 area units per ug/mL for formaldehyde. This value was determined from the slope of the calibration curve. The sensitivity may vary with the particular instrument used in the analysis.

1.2.5 Recovery: The recovery of formaldehyde from samples used in an 18-day storage test remained above 92 percent when the samples were stored at ambient temperature. These values were determined from regression lines which were

calculated from the storage data. The recovery of the analyte from the collection device must be at least 75 percent following storage.

1.2.6 Precision (analytical method only): The pooled coefficient of variation obtained from replicate determinations of analytical standards over the range of 0.4 to 2 times the target concentration was 0.0052 for formaldehyde (Section 4.3).

1.2.7 Precision (overall procedure): The precision at the 95 percent confidence level for the ambient temperature storage tests was (+ or -) 14.3 percent for formaldehyde. These values each include an additional (+ or -) 5 percent for sampling error. The overall procedure must provide results at the target concentrations that are (+ or -) 25 percent at the 95 percent confidence level.

1.2.8 Reproducibility: Samples collected from controlled test atmospheres and a draft copy of this procedure were given to a chemist unassociated with this evaluation. The formaldehyde samples were analyzed following 15 days storage. The average recovery was 96.3 percent and the standard deviation was 1.7 percent.

1.3 Advantages:

1.3.1 The sampling and analytical procedures permit the simultaneous determination of acrolein and formaldehyde.

1.3.2 Samples are stable following storage at ambient temperature for at least 18 days.

1.4 Disadvantages: None. 2. Sampling Procedure

2.1 Apparatus:

2.1.1 Samples are collected by use of a personal sampling pump that can be calibrated to within (+ or -) 5 percent of the recommended 0.1 L/min sampling rate with the sampling tube in line.

2.1.2 Samples are collected with laboratory prepared sampling tubes. The sampling tube is constructed of silane treated glass and is about 8-cm long. The ID is 4 mm and the OD is 6 mm. One end of the tube is tapered so that a glass wool end plug will hold the contents of the tube in place during sampling. The other end of the sampling tube is open to its full 4-mm ID to facilitate packing of the tube. Both ends of the tube are fire-polished for safety. The tube is packed with a 75-mg backup section, located nearest the tapered end and a 150-mg sampling section of pretreated XAD-2 adsorbent which has been coated with 2-HMP. The two sections of coated adsorbent are separated and retained with small plugs of silanized glass wool. Following packing, the sampling tubes are sealed with two 7/32 inch OD plastic end caps. Instructions for the pretreatment and the coating of XAD-2 adsorbent are presented in Section 4 of this method.

2.1.3 Sampling tubes, similar to those recommended in this method, are marketed by Supelco, Inc. These tubes were not available when this work was initiated; therefore, they were not evaluated.

2.2 Reagents: None required.

2.3 Technique:
2.3.1 Properly label the sampling tube before sampling and then remove the plastic end caps.
2.3.2 Attach the sampling tube to the pump using a section of flexible plastic tubing such that the large, front section of the sampling tube is exposed directly to the atmosphere. Do not place any tubing ahead of the sampling tube. The sampling tube should be attached in the worker's breathing zone in a vertical manner such that it does not impede work performance.

2.3.3 After sampling for the appropriate time, remove the sampling tube from the pump and then seal the tube with plastic end caps.

2.3.4 Include at least one blank for each sampling set. The blank should be handled in the same manner as the samples with the exception that air is not drawn through it.

2.3.5 List any potential interferences on the sample data sheet.

2.4 Breakthrough:

2.4.1 Breakthrough was defined as the relative amount of analyte found on a backup sample in relation to the total amount of analyte collected on the sampling train.

2.4.2 For formaldehyde collected from test atmospheres containing 6 times the PEL, the average 5 percent breakthrough air volume was 41 L. The sampling rate was 0.1 L/min and the average mass of formaldehyde collected was 250 ug.

2.5 Desorption Efficiency: No desorption efficiency corrections are necessary to compute air sample results because analytical standards are prepared using coated adsorbent. Desorption efficiencies were determined, however, to investigate the recoveries of the analytes from the sampling device. The average recovery over the range of 0.4 to 2 times the target concentration, based on the recommended air volumes, was 96.2 percent for formaldehyde. Desorption efficiencies were essentially constant over the ranges studied.

2.6 Recommended Air Volume and Sampling Rate:

2.6.1. The recommended air volume for formaldehyde is 24 L.

2.6.2. The recommended sampling rate is 0.1 L/min.

2.7 Interferences:

2.7.1 Any collected substance that is capable of reacting 2-HMP and thereby depleting the derivatizing agent is a potential interference. Chemicals which contain a carbonyl group, such as acetone, may be capable or reacting with 2-HMP.

2.7.2 There are no other known interferences to the sampling method.

2.8 Safety Precautions:

2.8.1 Attach the sampling equipment to the worker in such a manner that it well not interfere with work performance or safety.

2.8.2 Follow all safety practices that apply to the work area being sampled. 3. Analytical Procedure

3.1 Apparatus:

3.1.1 A gas chromatograph (GC), equipped with a nitrogen selective detector. A Hewlett-Packard Model 5840A GC fitted with a nitrogen-phosphorus flame ionization detector (NPD) was used for this evaluation. Injections were performed using a Hewlett-Packard Model 7671A automatic sampler.

3.1.2 A GC column capable of resolving the analytes from any interference. A 6 ft x 1/4 in OD (2mm ID) glass GC column containing 10 percent UCON 50-HB-5100 + 2 percent KOH on 80/100 mesh Chromosorb W-AW was used for the evaluation. Injections were performed on-column.

3.1.3 Vials, glass 2-mL with Teflon-lined caps.

3.1.4 Volumetric flasks, pipets, and syringes for preparing standards, making dilutions, and performing injections.

3.2 Reagents:

3.2.1 Toluene and dimethylformamide. Burdick and Jackson solvents were used in this evaluation.

3.2.2 Helium, hydrogen, and air, GC grade.

3.2.3 Formaldehyde, 37 percent, by weight, in water. Aldrich Chemical, ACS Reagent Grade formaldehyde was used in this evaluation.

3.2.4 Amberlite XAD-2 adsorbent coated with 2-(hydroxymethyl-piperidine (2-HMP), 10 percent by weight (Section 4).

3.2.5 Desorbing solution with internal standard. This solution was prepared by adding 20 uL of dimethylformamide to 100 mL of toluene.

3.3 Standard preparation:

3.3.1 Formaldehyde: Prepare stock standards by diluting known volumes of 37 percent formaldehyde solution with methanol. A procedure to determine the formaldehyde content of these standards is presented in Section 4. A standard containing 7.7 mg/mL formaldehyde was prepared by diluting 1 mL of the 37 percent reagent to 50 mL with methanol.

3.3.2 It is recommended that analytical standards be prepared about 16 hours before the air samples are to be analyzed in order to ensure the complete reaction of the analytes with 2-HMP. However, rate studies have shown the reaction to be greater than 95 percent complete after 4 hours. Therefore, one or two standards can be analyzed after this reduced time if sample results are outside the concentration range of the prepared standards.

3.3.3 Place 150-mg portions of coated XAD-2 adsorbent, from the same lot number as used to collect the air samples, into each of several glass 2-mL vials. Seal each vial with a Teflon-lined cap.

3.3.4 Prepare fresh analytical standards each day by injecting appropriate amounts of the diluted analyte directly onto 150-mg portions of coated adsorbent. It is permissible to inject both acrolein and formaldehyde on the same adsorbent portion. Allow the standards to stand at room temperature. A standard, approximately the target levels, was prepared by injecting 11 uL of the acrolein and 12 uL of the formaldehyde stock standards onto a single coated XAD-2 adsorbent portion.

3.3.5 Prepare a sufficient number of standards to generate the calibration curves. Analytical standard concentrations should bracket sample concentrations. Thus, if samples are not in the concentration range of the prepared standards, additional standards must be prepared to determine detector response.

3.3.7 Desorb the standards in the same manner as the samples following the 16-hour reaction time.

3.4 Sample preparation:

3.4.1 Transfer the 150-mg section of the sampling tube to a 2-mL vial. Place the 75-mg section in a separate vial. If the glass wool plugs contain a significant number of adsorbent beads, place them with the appropriate sampling tube section. Discard the glass wool plugs if they do not contain a significant number of adsorbent beads.

3.4.2 Add 1 mL of desorbing solution to each vial.

3.4.3 Seal the vials with Teflon-lined caps and then allow them to desorb for one hour. Shake the vials by hand with vigorous force several times during the desorption time.

3.4.4 Save the used sampling tubes to be cleaned and recycled.

3.5 Analysis:

3.5.1 GC Conditions
Column Temperature:
Bi-level temperature program - First level: 100 to 140 deg. C at 4 deg.
C/min following completion of the first level.
Second level: 140 to 180 deg. C at 20 deg. C/min following completion of the first level.
Isothermal period: Hold column at 180 deg. C until the recorder pen returns to baseline (usually about 25 min after injection).
Injector temperature: 180 deg. C
Helium flow rate: 30 mL/min (detector response will be reduced if nitrogen is substituted for helium carrier gas).
Injection volume: 0.8 uL
GC column: Six-ft x 1/4 -in OD (2 mm ID) glass GC column containing 10
percent
UCON 50-HB-5100+2 percent KOH on 80/100 Chromosorb W-AW.
NPD conditions:
Hydrogen flow rate: 3 mL/min
Air flow rate: 50 mL/min
Detector temperature: 275 deg. C

3.5.2 Chromatogram: For an example of a typical chromatogram, see Figure 4.11 in OSHA Method 52.

3.5.3 Use a suitable method, such as electronic integration, to measure detector response.

3.5.4 Use an internal standard method to prepare the calibration curve with several standard solutions of different concentrations. Prepare the calibration curve daily. Program the integrator to report results in ug/mL.

3.5.5 Bracket sample concentrations with standards.

3.6 Interferences (Analytical)

3.6.1 Any compound with the same general retention time as the analytes and which also gives a detector response is a potential interference. Possible interferences should be reported to the laboratory with submitted samples by the industrial hygienist.

3.6.2 GC parameters (temperature, column, etc.) may be changed to circumvent interferences.

3.6.3 A useful means of structure designation is GC/MS. It is recommended this procedure be used to confirm samples whenever possible.

3.6.4 The coated adsorbent usually contains a very small amount of residual formaldehyde derivative (Section 4.8).

3.7 Calculations:

3.7.1 Results are obtained by use of calibration curves. Calibration curves are prepared by plotting detector response against concentration for each standard. The best line through the data points is determined by curve fitting.

3.7.2 The concentration, in ug/mL, for a particular sample is determined by comparing its detector response to the calibration curve. If either of the analytes is found on the backup section, it is added to the amount found on the front section. Blank corrections should be performed before adding the results together.

3.7.3 The acrolein and/or formaldehyde air concentration can be expressed using the following equation:
mg/m(3) = (A)(B)/C

where A = ug/mL from 3.7.2,
B = desorption volume,
and C = L of air sampled.

No desorption efficiency corrections are required.

3.7.4 The following equation can be used to convert results in mg/m(3) to ppm.
ppm = (mg/m(3))(24.45)/MW
where mg/m(3) = result from 3.7.3,
24.45 = molar volume of an ideal gas at 760 mm Hg
and 25 deg. C, MW = molecular weight (30.0).

4. Backup Data
4.1 Backup data on detection limits, reliable quantitation limits, sensitivity and precision of the analytical method, breakthrough, desorption efficiency, storage, reproducibility, and generation of test atmospheres are available in OSHA Method 52, developed by the Organics Methods Evaluation Branch, OSHA Analytical Laboratory, Salt Lake City, Utah.

4.2 Procedure to Coat XAD-2 Adsorbent with 2-HMP:

4.2.1 Apparatus: Soxhlet extraction apparatus, rotary evaporation apparatus, vacuum dessicator, 1-L vacuum flask, 1-L round-bottomed evaporative flask, 1-L Erlenmeyer flask, 250-mL Buchner funnel with a coarse fritted disc, etc.

4.2.2 Reagents:

4.2.2.1 Methanol, isooctane, and toluene.

4.2.2.2 2-(Hydroxymethyl)piperidine.

4.2.2.3 Amberlite XAD-2 non-ionic polymeric adsorbent, 20 to 60 mesh, Aldrich Chemical XAD-2 was used in this evaluation.

4.2.3 Procedure: Weigh 125 g of crude XAD-2 adsorbent into a 1-L Erlenmeyer flask. Add about 200 mL of water to the flask

and then swirl the mixture to wash the adsorbent. Discard any adsorbent that floats to the top of the water and then filter the mixture using a fritted Buchner funnel. Air dry the adsorbent for 2 minutes. Transfer the adsorbent back to the Erlenmeyer flask and then add about 200 mL of methanol to the flask. Swirl and then filter the mixture as before. Transfer the washed adsorbent back to the Erlenmeyer flask and then add about 200 mL of methanol to the flask. Swirl and then filter the mixture as before. Transfer the washed adsorbent to a 1-L round-bottomed evaporative flask, add 13 g of 2-HMP and then 200 mL of methanol, swirl the mixture and then allow it to stand for one hour. Remove the methanol at about 40 deg. C and reduced pressure using a rotary evaporation apparatus. Transfer the coated adsorbent to a suitable container and store it in a vacuum desiccator at room temperature overnight. Transfer the coated adsorbent to a Soxhlet extractor and then extract the material with toluene for about 24 hours. Discard the contaminated toluene, add methanol in its place and then continue the Soxhlet extraction for an additional 4 hours. Transfer the adsorbent to a weighted 1-L round-bottom evaporative flask and remove the methanol using the rotary evaporation apparatus. Determine the weight of the adsorbent and then add an amount of 2-HMP, which is 10 percent by weight of the adsorbent. Add 200 mL of methanol and then swirl the mixture. Allow the mixture to stand for one hour. Remove the methanol by rotary evaporation. Transfer the coated adsorbent to a suitable container and store it in a vacuum desiccator until all traces of solvents are gone. Typically, this will take 2-3 days. The coated adsorbent should be protected from contamination. XAD-2 adsorbent treated in this manner will probably not contain residual acrolein derivative. However, this adsorbent will often contain residual formaldehyde derivative levels of about 0.1 ug per 150 mg of adsorbent. If the blank values for a batch of coated adsorbent are too high, then the batch should be returned to the Soxhlet extractor, extracted with toluene again and then recoated. This process can be repeated until the desired blank levels are attained.
The coated adsorbent is now ready to be packed into sampling tubes. The sampling tubes should be stored in a sealed container to prevent contamination. Sampling tubes should be stored in the dark at room temperature. The sampling tubes should be segregated by coated adsorbent lot number. A sufficient amount of each lot number of coated adsorbent should be retained to prepare analytical standards for use with air samples from that lot number.

4.3 A Procedure to Determine Formaldehyde by Acid Titration: Standardize the 0.1 N HCl solution using sodium carbonate and methyl orange indicator.
Place 50 mL of 0.1 M sodium sulfite and three drops of thymophthalein indicator into a 250-mL Erlenmeyer flask. Titrate the contents of the flask to a colorless endpoint with 0.1 N HCl (usually one or two drops is sufficient). Transfer 10 mL of the formaldehyde/methanol solution (prepared in 3.3.1) into the same flask and titrate the mixture with 0.1 N HCl, again, to a colorless endpoint. The formaldehyde concentration of the standard may be calculated by the following equation:

$$\text{Formaldehyde, mg/mL} = \frac{\text{acid titer X acid normality X 30.0}}{\text{mL of sample}}$$

This method is based on the quantitative liberation of sodium hydroxide when formaldehyde reacts with sodium sulfite to form the formaldehyde-bisulfite addition product. The volume of sample may be varied depending on the formaldehyde content but the solution to be titrated must contain excess sodium sulfite. Formaldehyde solutions containing substantial amounts of acid or base must be neutralized before analysis.

Appendix F: Laboratory Clearance Report
Vacating a Research Laboratory

Laboratory Clearance Report

Name of Principle Investigator: _____

Name of Department: _____

Building: _____ Room Number: _____

- ☐ Equipment (instrumental) has been updated. Electronic or hard copies provided.
- ☐ Lab drawers have been emptied of all chemical containing glassware. Clean, dried glassware has been placed either in boxes or in clearly labeled drawers.
- ☐ All broken glass has been placed in the Broken Glass container.
- ☐ Lab benches have been cleaned (disinfected, if necessary).
- ☐ Fume hoods have been emptied and cleaned.
- ☐ Chemicals (from fume hoods, refrigerators, freezers, ovens, and/or storage cabinets) that are in good condition are clearly marked to either be transferred to another principle investigator or be transferred to the lab manager to add these chemicals to the stockroom inventory.
- ☐ The regulators on gas cylinders have been removed and the caps secured in place. (Return the gas cylinder(s) to the supplier or specifically transfer to another principle investigator or lab manager.)
- ☐ All hazardous chemical waste has been identified and placed in a designated area for disposal.

Signature of Completion by Principle Investigator: _____

Date of inspection: _____ Time: _____

Inspection conducted by _____/_____
Print Name Signature

Job Title: _____

REVISION HISTORY

Original Document: January 1991

Revision Date	Comments
September 1994	--
August 1996	--
October 2000	--
July 2006	--
May 2012	Updated Section 1.1—Chemical Hygiene Officers and Section 3.—Records and Recordkeeping. Removed Section 2.2.5 Procedures for use of Radioisotopes. (University no longer holds a radioactive license and has disposed of all radioactive material.)
May 2013	Updated Sections 1-Introduction, 2.1.3—Housekeeping, 2.2-Procedure-Specific Safety Procedures, 2.3.1—Ventilation, 5.2-Exposure Assessment. Added Sections 2.1.6—First Aid Kits and 2.2.5—Procedure for Peroxide-Forming Compounds. Also updated Material Safety Data Sheet (MSDS) to Safety Data Sheet (SDS) throughout document. Added Appendices.
May 2014	Updated Section 2.1.2—Protective Clothing and Equipment and Appendix C-2—Lab Safety Training, College of Arts & Sciences, Physical Sciences, and Section 5.2 Exposure Assessment # 2 and added an Appendix with OSHA regulations regarding formaldehyde (formalin).