

School of Life Sciences Lab Safety Handbook

A reference guide for the Principal Investigator

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RESOURCES

ENVIRONMENTAL HEALTH & SAFETY

Phone **480-965-1823**

Website <http://www.asu.edu/uagc/EHS/>

Email EHS@asu.edu

EH&S Website, under "Guidance Documents", see:

- 1) Chemical Hygiene Plan**
- 2) Laboratory Chemical Safety**
- 3) Hazardous Waste Management**
- 4) Biosafety Manual**

SoLS Safety Website: <http://sols.asu.edu/safety/index.php>

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Lab Handbook

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General Lab Safety:

No extension cords.

No open-toed shoes.

No food or drink.

You have known these rules for years, but look around your lab to see if they are being followed.

For Office Safety and Classroom Safety, see Guidance Documents at the EH&S website: <http://www.asu.edu/uagc/EHS/guidance.htm> under Fire Prevention and Safety.

Please remember that websites change periodically, and all compliance information and documents can always be found on the Environmental Health and Safety home page.

1. Walk-Through Orientation

Each member of the lab should be given a safety orientation, which should include:

- Location of eyewashes and showers
- PPE requirements
- Emergency Response Guide (Flip Folder)
- Evacuation Plan
- Emergency Contacts for Lab Problems

Use the "Responsible Party Information Sheet", as a guide. These forms are available on the SoLS Safety website. Completion of the safety orientation should be recorded on the individual's training record.

Forms for recording the safety orientation and training can be designed by each lab, or the Safety Committee will assist you in preparing a format. There are sample formats in "Forms and Links" on the Safety Home Page. A composite document, such as a "Lab Training Sheet" can be posted in a visible location to document which personnel have been trained and are authorized to work in the lab.

2. Training Classes for Lab Personnel **All Research Lab Workers**

- 1) Fire Safety and Prevention
- 2) Lab Safety

Website for Training Classes:

<http://www.asu.edu/uagc/EHS/envirohealthsafety.htm>

Specialty Training

For a complete list, see <http://www.asu.edu/uagc/EHS/trainingtable.htm>

See p. 14 of this manual for Biohazard Training Requirements
Hazardous Chemicals (EH& S by request)
Radiation Safety
Hazardous Waste Management
Lasers
Field Safety

**KEEP A RECORD OF ALL LAB PERSONNEL'S TRAINING. THIS RECORD
MUST BE AVAILABLE TO INSPECTORS.**

3. Check In/Check Out

(Page 5 of ASU Chemical Hygiene Plan at:

<http://www.asu.edu/uagc/EHS/riskforms/ASU%20Chemical%20Hygiene%20Plan.pdf>)

Each department must establish check-in/check-out procedures for laboratory turnovers where the principal investigator is changing in order to ensure that chemicals, hazardous waste, biological waste, and other materials are not left in the laboratory. The Environmental Protection Agency (EPA) requires that all chemicals not in use are properly identified and that waste is disposed of correctly.

The check-in/check-out procedures must include the following:

- All chemicals, including hazardous waste, must be identified and properly labeled;
- All containers of hazardous waste, including out of date and/or unusable chemicals, must be disposed of in accordance with ASU's [Hazardous Waste Management Compliance Guidelines](#);
- Any usable chemicals should be transferred to another laboratory. The department safety coordinator should be contacted for assistance in determining which chemicals can be issued to another laboratory;
- Biological waste and sharps must be disposed of in accordance with ASU's [Biological Hazardous Waste Compliance Guidelines](#);
- Compressed gas cylinders must be removed from the laboratory by contacting Laboratory Stores Purchasing, 965-9079;
- Any radioactive waste, radioactive materials and radiation producing equipment must be removed from the laboratory.

These activities should be coordinated through [ASU's Office of Radiation Safety](#).

- All refrigerators, fume hoods and cabinets should be cleaned; and
- Any outdated/unusable equipment should be sent to the [ASU Surplus Property Department](#). Please contact Rick Olson at 965-5087 for specific instructions.

The safety coordinator from each department is responsible for making certain that hazards are removed from the laboratory prior to any principal investigators departure from the laboratory. The safety coordinator should establish an inspection process and sign-off on any laboratory transfer. Following these procedures will ensure EPA compliance and that the incoming faculty member has a clean, healthy environment in which to work.

CHECK IN SHOULD BE DONE WHEN YOU FIRST TAKE OCCUPANCY OF A LAB, OR NOW IF YOU ARE ALREADY IN A LAB.

THE PI WILL BE HELD RESPONSIBLE FOR THE CHECK OUT.

THERE WILL BE PENALTIES FOR FAILURE TO PROPERLY FOLLOW THE EH&S GUIDELINES BEFORE VACATING A LAB.

4. Labeling of Chemicals

(Page 10 of ASU Chemical Hygiene Plan at:

<http://www.asu.edu/uagc/EHS/riskforms/ASU%20Chemical%20Hygiene%20Plan.pdf>)

Hazardous chemicals in the laboratory must be adequately labeled. Laboratory supervisors must maintain labels with legible writing, indicating the name(s) of the container's contents, in English using acceptable IUPAC chemical names. Labels must include any applicable hazard warning, e.g., concentration, hazard identification, date of purchase or packaging, date of last peroxide test.

Each container of a hazardous chemical received from the manufacturer with a label must have information that gives appropriate identification and hazards of that chemical. The name and address of the chemical manufacturer or distributor must also be on the label. If a container arrives without the manufacturer's label, an appropriate label must be affixed to it. Labels must not be removed, except under the following conditions:

- Container is immediately re-labeled; or
- Chemical in the container is removed, a new type of chemical is placed in the container and the container re-labeled with the identity of the new chemical.

- Bottles at benches should be labeled with the initials of the person who mixed the solution and the date it was mixed. Labels must list the common name of the solution, such as ethanol (not EtOH) and water (not H₂O). This is for the ease of emergency responders, such as firefighters that might not recognize an abbreviation or acronym. If you prefer, a list of all abbreviations and acronyms with their corresponding general names can be posted at each bench.

5. Chemical Inventory and MSDS

(Page 5 ASU Chemical Hygiene Plan at:

<http://www.asu.edu/uagc/EHS/riskforms/ASU%20Chemical%20Hygiene%20Plan.pdf>)

Identification of all chemicals, including non-hazardous items, in the laboratory is required. A chemical inventory for each laboratory must be submitted to Environmental Health & Safety and include a complete inventory of the chemicals used or stored in the work area or laboratory, including compressed gas cylinders. The chemical inventory template is available in "Forms and Links" on the SoLS Safety Main Page. The list includes an alphabetized list of the complete International Union of Pure and Applied Chemistry (IUPAC) names, the CAS# (found on the container), the quantity stored, the storage location in the work area, and the hazard codes.

Each lab is required to keep MSDS (Material and Safety Data Sheets) copies in the lab for all the lab's chemicals. The copies must be accessible to lab personnel 24 hours/day. These can be obtained from www.hazards.com and enter "msds" in the search box.

6. Personal Protection Equipment (PPE)

Personal Protective Equipment is defined all clothing and other work accessories designed to create a barrier against workplace hazards. Some examples include safety goggles, face shields, chemical resistant gloves, lab coats, hearing protectors and respirators. The PI is responsible for providing Personal Protective Equipment for *each* employee working in her/his laboratory, as well as, for training in its proper use. Lab personnel are responsible for maintaining the equipment in a sanitary and reliable condition. The use of Personal Protection Equipment is required under circumstances where any hazards of process or environment, chemical hazards, radiological hazards, or mechanical irritants are going to be encountered in a manner capable of causing injury through absorption, inhalation or physical contact. Follow recommendations outlined in the Material Safety Data Sheet (MSDS) for the appropriate Personal Protection Equipment to be used when handling specific hazardous chemicals.

Specific details and examples pertaining to any and all of the aforementioned areas of concern are available from the SoLS Safety and Compliance Officer.

7. Prior Approval Policy

(Page 7 ASU Chemical Hygiene Plan at:

<http://www.asu.edu/uagc/EHS/riskforms/ASU%20Chemical%20Hygiene%20Plan.pdf>)

Prior approval is the departmental or laboratory procedure for evaluating new operations. This process involves the identification of hazards, management of risk and evaluation of pollution prevention/waste minimization. Work with hazardous chemicals requires prior approval before beginning new laboratory activities. Prior approval is accomplished by completing a [Laboratory Safety Prior Approval Form](#) (found on the website noted above and on the SoLS Safety website). Completed Prior Approval forms are kept at the laboratory for review by EH&S or the safety committee.

8. Hazardous Waste

(Complete Guide at <http://www.asu.edu/uagc/EHS/chemical1.htm>)

State and federal hazardous waste regulations specifically require the person who generates a waste to determine if the waste is a hazardous waste by using the following methods:

1. Determine if the waste is listed as a hazardous waste in the regulations; OR
2. If the waste is not listed as a hazardous waste in the regulations, determine if the waste exhibits any of the characteristics of a hazardous waste, i.e., ignitability, corrosivity, reactivity, or toxicity, by either:
 - testing the waste according to approved EPA methods or according to an equivalent approved method; or
 - applying knowledge of the hazard characteristic of the waste in light of the materials or the processes use

For your convenience, consider all waste chemical formulations (abandoned, used, out dated, or otherwise waste-like chemicals and formulations) as a hazardous waste unless the particular waste has been determined not a hazardous waste by EH&S. Contact EH&S for technical assistance at (480) 965-8554.

Please post in your lab the "ASU Hazardous Chemical Fact Sheet", available in "Forms & Links" on the SoLS Safety Main Page.

Hazardous Waste containers:

- Must be in good condition.
- Must be closed when not in use.
- Must not be stored near containers with incompatible hazardous wastes.
- Must be labeled with a hazardous waste tag which contains the following information:

Chemical Name
Amount
Volume %
Generator (responsible individual)
Phone number
Date
Department
Building/room#
Category

When the waste container is ready for pick-up (Note: Do not fill waste container beyond the bottom of the neck of the container) and the waste tag has been completed, call (480) 965-3899 or (480) 965-8554, forward the top copy of the waste tag to EH&S via campus mail (Environmental Health & Safety - 5412) or process the [request on line](#).

**PLEASE GO TO THE EH&S WEBSITE AND CLICK ON
"GUIDANCE DOCUMENTS" TO SEE THE ENTIRE
HAZARDOUS WASTE MANAGEMENT PLAN.**

(<http://www.asu.edu/uagc/EHS/chemical1.htm>)

9. Evacuation Plan

Develop a plan for all lab personnel to follow in the event of an evacuation:

- 1) Identify the nearest exit (**do not use** elevators).
- 2) Have a meeting place more than 50' from the building.

3) Post the information near the exits of your lab.

10. Emergency Procedures

ALL EMERGENCY PROCEDURES ARE LISTED ON THE ASU EMERGENCY RESPONSE GUIDE (RED TABS, WITH FLIP PAGES). IF YOU DON'T HAVE ONE IN YOUR LAB, NOTIFY EH&S OR YOUR SOLS SAFETY COMMITTEE.

MAKE CERTAIN THAT EVERY PERSON IN YOUR LAB KNOWS WHERE THIS INFORMATION CAN BE FOUND AND HAS READ THE INFORMATION.

THE FLIP FOLDER MUST BE READILY AVAILABLE IN A CONSPICUOUS PLACE SO THAT IT IS EASILY ACCESSED IN AN EMERGENCY.

11. Certification, Signage, Forms

(Page 4 ASU Chemical Hygiene Plan at:

<http://www.asu.edu/uagc/EHS/riskforms/ASU%20Chemical%20Hygiene%20Plan.pdf>)

Laboratory Certification

Laboratory certification is the process which EH&S uses to guarantee each laboratory fulfills the requirements of the CHP. All laboratory supervisors, managers, and principal investigators must certify that the laboratory fulfills the obligations of this plan on an annual basis. Furthermore, the annual review and certification provide for an annual self-evaluation of the plan.

Responsible Party Information Sheet

In order to obtain laboratory certification, the supervisor must submit a Responsible Party Information Form (RPI) to EH&S annually or as changes occur. The [RPI Form](#) (found at the link noted above and on the SoLS Safety website) identifies emergency contacts, locations of emergency equipment, and any hazards or special concerns specific to each laboratory. While EH&S maintains this information, the Police Department is forwarded a copy of the RPI for emergency contact information (see [RPI Form](#)).

Each laboratory is also responsible for submitting a complete and current chemical inventory as part of the certification requirements. Upon receipt of the RPI, the current chemical inventory and a returned laboratory inspection report (see the Audits and Compliance section of the EH&S Chemical Hygiene Plan), EH&S will assume that the provisions outlined in the CHP have been accepted by the laboratory personnel and will issue the certification. The certification lists the principal investigator(s) by name, the hazards located in the laboratory, and displays the diamond shaped National Fire Protection Association (NFPA) hazard rating. General information helpful during emergencies is also listed. The form is mailed to the laboratory and it is the responsibility of the safety coordinator or principal investigator to display the certification form on the outside of the entrance of the laboratory. The date

the form is issued signifies the anniversary date to re-certify the laboratory. Failure to comply with certification requirements could result in closure of the laboratory or facility.

SIGNAGE MUST BE AVAILABLE THAT LISTS WHO TO CONTACT IN AN EMERGENCY.

Forms are available on the EH&S website:

<http://www.asu.edu/uagc/EHS/riskforms.htm>

You need **three forms** to qualify for certification:

- Responsible Party Information Sheet

- Chemical Inventory

- Laboratory Inspection Report

12. WORKING WITH BIOHAZARDS

A. Biohazard Training

ASU Biosafety Training Requirements

Material	Forms	Training	Biosafety Level
Recombinant DNA (rDNA)	ORSPA 112A	Lab Training from Principal Investigator	BSL1
Human blood or cell lines	ORSPA 112B	Bloodborne Pathogens (BBP)	BSL2
Infectious Materials/Toxins	ORSPA 112B	BBP & Biosafety (with some Biosecurity)	BSL2/BSL3
Select Agents or Toxins	ORSPA 112C	Biosafety & Biosecurity	BSL3

B. Biohazard Signage

Label all areas where biohazards are present. If your lab works with biological materials, a sign should be posted at the entrance to the lab that tells the level of biosafety work being done (BSL2, or BSL3, etc), what agent is in use, and what PPE is required for entry.

Contact EH&S or your SoLS safety committee for help with proper signage.

C. Biohazard Registration

See the table listed under Biohazard Training for a quick reference to the forms needed for your work. Recombinant DNA, human cell lines, and infectious agents must all be registered with the IBC (Institutional Biosafety Committee) on form 112 AB.

Use of Select Agents or Toxins must be registered on Form 112 C.

Forms are available at:

<http://researchadmin.asu.edu/compliance/biosafety/forms.htm>

This is on the ASU Research and Sponsored Projects (Office of) website.

D. Biohazard Inventory

The signage outside your lab entrance should list all biohazard materials in use in your lab. This list should be supported by approved IBC submittals.

Hazardous Chemicals

(Page 37 ASU Chemical Hygiene Plan at:

<http://www.asu.edu/uagc/EHS/riskforms/ASU%20Chemical%20Hygiene%20Plan.pdf>)

IF YOU ARE UNFAMILIAR WITH A CHEMICAL – LOOK IT UP BEFORE ALLOWING ITS USE IN YOUR LAB. ALWAYS CHECK THE MSDS!!!!

Also, review the “Partial List of Incompatible Chemicals”, listed in Resources on the Safety Main Page.

Certain chemicals **react with water** to evolve heat and flammable or toxic gases and should be stored and handled so that they do not come in contact with liquid water or water vapor.

Air reactive chemicals can spontaneously and violently react with air, and most are pyrophoric, meaning that they spontaneously ignite with air. These chemicals should be stored tightly in an inert atmosphere or in an inert liquid.

Certain chemicals are **shock sensitive** and have the potential for producing a violent explosion when subjected to shock or friction.

Examples of water and air reactive compounds and shock sensitive chemicals can be found in the ASU Chemical Hygiene Plan.

Peroxides/Peroxide-Forming Chemicals

Peroxide formation occurs when certain laboratory chemicals **react with air at ordinary temperatures to form peroxy compounds, which are violently reactive or explosive.**

Organic peroxides are classified as low-power explosives that are hazardous because of the sensitivity to shock/impact, sparks, other ignition sources, heat, friction, light and strong oxidizing and reducing agents.

All organic peroxides are flammable and have a specific rate of decomposition under a given set of conditions.

Examples of Peroxides/Peroxidable chemicals commonly found in ASU Life Sciences' laboratories include, but are not limited to, ethyl ether and tetrahydrofuran. Additional examples can be found in the Chemical Hygiene Plan.

Always read the material safety data sheet before using a chemical to ensure that you are familiar with the potential hazards.

Sensitizers and/or Allergens

Sensitizers and/or allergenic chemicals include a wide variety of substances that can produce skin and lung hypersensitivity. Common examples include nickel, chromates, formaldehyde, isocyanates and certain phenols. Once sensitized, repeated exposures to even the most minute levels of sensitizers can result in life-threatening allergic reactions.

A sensitizer causes a substantial portion of people to develop an allergic reaction in normal tissue after repeated exposure to it. The reaction may be as mild as a rash (contact dermatitis) or as serious as anaphylactic shock.

Acutely Toxic Chemicals

Highly or acutely toxic chemicals are those that have been found through testing of laboratory animals to cause death when exposed at certain levels. **Material Safety Data Sheets must be reviewed prior to using any chemical in the laboratory.**