

# Laboratory Health & Safety

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## University of Tennessee Safety Program LS-001

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### Purpose

The University of Tennessee is committed to providing a healthy and safe working and learning environment, and to supporting environmentally sound practices in the conduct of university activities. It is University procedure to comply with all applicable regulations and requirements related to research and teaching in laboratories. All university activities are to be conducted in a manner that ensures the protection of students, faculty, staff, visitors, and the environment. To this end, the University has created a laboratory safety program, the goal of which is to minimize the risk of injury or illness to laboratory researchers and workers. To accomplish this goal, the University will endeavor to provide the facilities, equipment, training and support necessary to maintain safe laboratories.

It is the intent of this program that University personnel plan and carry out their research and teaching activities in a manner that:

- Protects the health and safety of employees, students, the local community, and the environment.
- Complies with applicable federal, state, and municipal laws and regulations, as well as University policies and procedures.

### Scope and Applicability

This program applies to all laboratories and laboratory workers at the University of Tennessee Knoxville. This includes the main campus, Cherokee Farm, or any other campus or off-campus laboratory related activity that would fall under UTK oversight. The University of Tennessee, Institute of Agriculture (UTIA) is considered a separate entity regarding this program.

This Program applies to:

1. All University of Tennessee faculty, staff, visiting scholars using UT property, as well as students who conduct activities or oversee operations of a laboratory as that term is defined in this Program
2. The use by these individuals of potentially hazardous operations, materials, or energy.

This program applies to all laboratories and laboratory workers at the University of Tennessee, Knoxville. This includes the UTK main campus, research at JIAM, or any other campus or off-campus laboratory related activity that would fall under UTK oversight. The University of Tennessee Institute of Agriculture (UTIA) is considered a separate entity regarding this program

While every research and teaching laboratory may have differing specific requirements for what is needed to ensure a healthy and safe working and learning environment, the University acknowledges that there are some requirements common to all. The health and safety requirements for all laboratories must include these general requirements:

1. Adequate training and supervision of persons working in laboratory spaces

2. RESERVED
3. Provision of personal protective equipment (PPE), as applicable, to those conducting activities in laboratories
4. Established requirements for procuring, using, transporting, and disposing of potentially hazardous materials and physical hazards, as applicable
5. Established requirements for responding to incidents and emergencies
6. Clearly assigned roles and responsibilities

Specific requirements depend on the materials, equipment, and environmental factors unique to each laboratory. The Lab-Specific Chemical Hygiene Plan is the repository of the lab specific requirements and must be established and maintained by the Principal Investigator of the Lab or the lab manager/supervisor.

All University employees are responsible for adhering to applicable safety policies, procedures, laws, and rules, for promoting the safety of co-workers and students and for protecting the local environment. Employees must report to their supervisors or other institutional reporting authorities and correct, if possible, all safety and environmental concerns. Principal Investigators, Supervisors, Department Heads and Deans have additional responsibilities as articulated below in the roles and responsibilities section.

Failure to follow applicable safety requirements for the specific laboratory spaces in which a university employee works, or for which he or she has supervisory responsibility, may result in a corrective action plan with the potential to escalate to the closure of the laboratory or banning from laboratory spaces and/or processes.

## Abbreviations and Definitions

### Abbreviations

**AC:** Alternating Current

**ACGIH:** – American Conference of Governmental Industrial Hygienists

**CAP:** Corrective Action Plan

**CFR:** Code of Federal Regulations

**CHP:** Chemical Hygiene Plan

**dBA:** Decibels, A-weighted scale

**EHS:** UTK Environmental Health and Safety (excluding UTIA)

**EPA:** Environmental Protection Agency

**LAMS:** Laboratory Assessment Management System

**NFPA:** National Fire Protection Association

**PI:** Principal Investigator

**PPE:** Personal protective equipment

**POTW:** Publicly owned treatment works

**SDS:** Safety Data Sheets

**TDEC:** Tennessee Division of Environment and Conservation

**UTK:** University of Tennessee at Knoxville

**UTIA:** University of Tennessee Institute of Agriculture

## Definitions

**Campus Safety Resources:** includes the following groups:

1. Biosafety Office
2. UT Knoxville Office of Environmental Health and Safety
3. Radiation Safety Department
4. Risk Management Office
5. Office of Emergency Management

**Hazardous Substance:** is defined as a chemical, biological, or radiological substance capable of causing injury. “Hazardous Substance” includes definitions, classifications, and criteria established by 29 C.F.R. 1910.1200 Appendix A.

**Laboratory:** is defined as a location where teaching, experimentation, or research occurs that involves hazardous substances or physical hazards. Examples include, but are not limited to, chemistry labs, biology labs, physics labs, and engineering labs. The term laboratory does not include computer labs, geography labs, and similar spaces where no chemical, physical, biological, or radiological hazards are present.

**Physical Hazard:** includes, but is not limited to, the following:

1. Exposed energized conductors operating at more than 50 volts AC
2. Shear points, crush points, nip points, or run-in points that are not adequately guarded
3. Pressure vessels operating in excess of 15 pounds per square inch for compressed gases
4. Flammable liquids, solids or gases as defined by NFPA 30: Flammable and Combustible Liquids Code
5. Cryogenic fluids and reactive materials as defined by NFPA 45: Standard on
6. Fire Protection for Laboratories Using Chemicals
7. Noise above 90 decibels, A-weighted scale, averaged over an 8-hour day
8. Non-ionizing radiation that exceeds standards published by the American Conference of Governmental Industrial Hygienists (ACGIH)
9. Equipment producing ionizing radiation

**Principal Investigator (PI):** is the administrative head of the research laboratory or shop. The principal investigator determines research/work objectives, designs experiments, and assigns responsibilities to laboratory/shop staff and students.

**Supervisor:** is defined as the PI or other senior individual assigned by the PI who is competent in and can responsibly oversee the research/work procedures being performed to include proper technique(s) and safety precautions.

**Chemical Hygiene Plan:** a detailed description of policies and work practices designed to protect employees

from the health hazards of dangerous chemicals and processes present, produced, or used in a laboratory

## Roles and Responsibilities

### Chancellor

The chancellor will support and encourage a culture of safety and the use of best practices in laboratory protocols and procedures and ensure that such practices are implemented and enforced in academic and administrative units for which he/she is responsible.

### Deans

Deans shall work with departments and the central administration to provide appropriate facilities, infrastructure, and resources to support the safe conduct of research within their college. Deans or their designee shall participate in the laboratory safety problem resolution process to ensure problems are resolved.

### Department Heads

Department heads will support and encourage a culture of safety and the use of best practices in laboratory protocols and procedures. Department Heads will implement and enforce those procedures in their academic or administrative units and communicate that expectation to those charged with the supervision of laboratories. Department Heads shall ensure that Principal Investigators (PIs) within their department fulfill their administrative safety obligations.

Department Heads shall collaborate with the Environmental Health and Safety department to facilitate timely resolutions to unsafe conditions when such conditions are reported. They shall also work with the deans and contribute resources and support necessary to resolve safety issues when PIs are unable to comply with safety requirements.

### Principal Investigators (PIs)

PIs are faculty members or research scientists overseeing research laboratories and have the primary responsibility for maintaining a safe laboratory environment. The PI shall ensure that faculty, students, staff and visiting scholars receive the appropriate training, instruction, and mentorship necessary to work safely in his/her laboratory. In addition, the PI shall ensure that equipment and supplies are in place so that research can be conducted safely. Moreover, the PI is responsible for taking the actions necessary for his/her laboratory to comply with the University of Tennessee Policies as well as with all federal, state, and local regulations.

The PI, with assistance from EHS, shall ensure that the training programs available to people under his/her supervision address the hazards posed by the specific materials and equipment in his/her laboratory.

### Supervisors and Lab Managers

Those responsible for directly, or indirectly supervising labs, shops and studios that involve chemical, physical, biological, or radiological hazards will support and encourage a culture of safety and the use of best practices in:

- understanding the risks and requirements associated with the laboratories, shops, or studios they oversee
- assuring that appropriate precautions are taken against hazards and unsafe practices
- making proper personal protective equipment available to all personnel
- maintaining workplace equipment and machinery

- overseeing and maintaining diligence in assuring that medical surveillance of impacted employees is conducted
- following up and closing the gaps identified in the Corrective Action Plans (CAP) that are generated from safety audits or other mechanisms for identifying compliance, program, or best practice gaps
- ensuring that students and employees receive job and hazard-specific safety training.

### **Campus safety resources**

Campus safety resources will:

- Provide program implementation tools and training
- Provide guidance to departments, supervisors, and PI regarding this or any other environmental, health, or safety program and/or procedure
- Review federal, state, and local laws and regulations pertaining to laboratory safety and for recommending appropriate program and procedural changes
- Establish and monitor safety practices, training programs, and review mechanisms that support safe laboratory practices
- Partner with and support the PIs in the preparation of training materials, chemical hygiene plans, safety systems, and monitoring as requested
- Develop, deploy, and perform (as necessary) general lab safety training
- Work with campus deans, directors, department heads, or program managers to ensure laboratory EHS procedures are disseminated
- Provide guidance and technical assistance to deans, department heads, and PIs in identifying, evaluating, and correcting health and safety hazards
- Develop programs for the safe use of hazardous radiological, biological, and chemical substances and radiation producing devices.
- Oversee and manage hazardous waste disposal services
- Review and revise the procedures periodically
- Provide the most current version of this procedure for posting in the Laboratory Safety Manual.

### **Lab Users**

UTK employees, visitors, students, and all other personnel authorized to conduct activities in University of Tennessee laboratories should take appropriate and necessary steps to protect themselves and others from obvious hazards, abide by safe work practices, observe safety-related directions, be familiar with University emergency response plans, be proactive in learning about potential hazards associated with their work and use personal protective equipment and engineering controls appropriate to their work.

Faculty, students, staff, and visiting scholars are responsible for promptly notifying and reporting potentially unsafe conditions and environmental health hazards, as well as injuries and illnesses in the laboratory, to the PI or to the PI's designated laboratory representative.

### **Safety Committees**

Safety Committee(s) will be maintained to partner with EHS to review and refine procedures associated with this Program; ensure checklists and templates are useful and appropriate; interactions with faculty are constructive and enhance compliance with this program; and safety issues arising through new facility construction and building remodeling as well as through changing federal, state, and local safety guidelines and

requirements are addressed.

## Procedures

Detailed specific health and safety requirements for research and teaching laboratories and for the potentially hazardous materials and physical hazards used in these laboratories, as updated from time to time, must be followed. These detailed requirements are “incorporated by reference” into this Program, which means that they form a part of this Program and have the same force and effect as this Program. Current requirements as well as required forms, contact information, and related documents can be found on the University’s EHS web page at <http://www.ehs.utk.edu/>

### Laboratory Safety Manual and Chemical Hygiene Plan

UTK laboratories have access to a new Laboratory Safety Manual with Chemical Hygiene Program tools and template. The purpose of the manual is to meet the basic regulatory requirements of the OSHA Laboratory Standard, for the development of a Chemical Hygiene Plan, and to provide laboratories with useful recommendations that can help achieve compliance with the intent of the OSHA Lab Standard and workplace safety rules and regulations. Every PI must develop a laboratory-specific Chemical Hygiene Plan consistent with the guidelines issued by the Occupational Safety and Health Administration and EHS for his/her laboratory. A laboratory specific template is included in the Laboratory Safety Manual. Chemical Hygiene Plan templates including templates for SOPs for hazardous materials will be posted on the EHS website at <http://www.ehs.utk.edu/>.

### Ensuring a Safe Work Environment

RESERVED for laboratory self-assessment information

EHS shall conduct independent surveys of all laboratory spaces according to a pre-determined audit cycle. A laboratory safety audit protocol is being developed.

### Procedure for Reporting Safety Hazards and Near Misses

The University’s commitment to health and safety can only be successful if individual members of the University community do their part by accepting responsibility for developing and practicing safety awareness. All safety hazards should be reported to the employee’s immediate supervisor as soon as possible. Work within the department to resolve the issue, if possible. Supervisors are encouraged to contact Environmental Health and Safety if there is no clear solution or if additional guidance is needed. All near misses (also known as a close call, or a non-injury accident) should be reported in a manner similar to other hazards. For additional information and contacts follow this link: <http://safety.utk.edu/occupational-safety/reporting-hazards/>.

The University of Tennessee Code of Conduct prohibits retaliation for good faith reporting of safety issues. Procedures devised for handling hazardous situations and materials shall be followed conscientiously and any member of the campus community shall feel authorized to stop work if he or she believes that continuation of the work poses an imminent danger to his or her safety or health or that of people in the vicinity. Additionally, it is considered a serious infraction of this safety program to intentionally cover up a safety matter that may lead to serious injury.

### EHS Issue Resolution Process

The Director of EHS has the authority to curtail or shut down any University activity considered to constitute an immediate or serious danger to health or safety. In the event of such curtailment or shutdown, the PI,

department head, dean and director meet and agree on a plan of action to remedy the situation.

### **Personal Protective Equipment**

All faculty, students, staff and visiting scholars must adhere to a laboratory dress code and use personal protective equipment (PPE) when working in potentially hazardous situations or around potentially hazardous materials and/or equipment.

### **Minors in Laboratories**

UTK has a safety plan for university departments or coordinated programs hosting minors who will be performing independent work in laboratories and shops. Minors participating in supervised instructional programs (e.g., Governor's School, KidsU, etc.) or University-hosted/guided tours are excluded from this plan. Minors shall be permitted in labs and shops as defined in this plan only if they are engaged in university-sponsored activities.

### **Particularly Hazardous Substances**

UTK has a safety guide for university labs to comply with the Occupational Safety and Health Administration's (OSHA) Chemical Hygiene Plan requirement to review and approve work involving "particularly hazardous" substances.

### **Door Placarding**

UTK has a procedure requiring the placarding of laboratory doors with hazard information relevant to emergency responders and lab visitors.

### **Chemical Inventories**

UTK has a procedure for assisting the Laboratory community with developing and submitting their annual chemical inventories. If additional information regarding chemical inventories is required that is not addressed by the procedure, contact [ehs\\_labsafety@utk.edu](mailto:ehs_labsafety@utk.edu).

### **Research Involving Hazardous and Toxic Materials**

The purchase, use, handling, and disposal of all hazardous and toxic materials must comply with all provisions, guidelines, and rules of TDEC, EPA, OSHA, the City of Knoxville Public Safety Offices, and the POTW.

### **Research Involving Controlled Substances**

Controlled substances are any drugs or chemical substances whose possession and use are regulated under the United States Controlled Substances Act. Management and possession criteria differ depending on the controlled substances "schedule." All controlled substances must be purchased and utilized in accordance with the UTK Controlled Substance Guide that can be found on the UTK EHS Web Page.

### **Office of Laboratory Animal Care**

The Office of Laboratory Animal Care (OLAC) is a service unit responsible for research and teaching animals across the University of Tennessee, Knoxville area campuses. OLAC's mission is to facilitate the research and teaching missions of the University while concurrently providing for the safe and ethical treatment of research animals. The OLAC web page can be found at: <https://vetmed.tennessee.edu/olac/>

### **Lasers, X-Rays, and Radioactive Materials**

The procedures for dosimetry, training, waste management and emergencies regarding LASERS, x-rays, and radioactive materials can be obtained from the Radiation Safety web page at:

<http://radiationsafety.utk.edu/> or by contacting the Radiation Safety Officer through the Office of

## Research and Engagement.

The door sign placarding program integrates the presence of radiation hazards into the signage placed outside each laboratory door. The authority for management of radiation safety in campus laboratories falls outside this program. Contact the Radiation Safety Department for radiation hazard guidance.

## Biological Hazards

The procedures related to issues of Biosafety can be found at: <http://biosafety.utk.edu/> or by contacting the Biosafety Officer through the Office of Research and Engagement.

The door sign placarding program integrates the presence of biological hazards into the signage placed outside each laboratory door. The authority for management of biological safety components in campus laboratories falls outside this program. Contact the Radiation Safety Department for radiation hazard guidance.

## The University of Tennessee Institute of Agriculture (UTIA)

Laboratories affiliated with UTIA are managed as separate entities as it pertains to Laboratory Safety. If you have questions or concerns regarding UTIA laboratories, refer to their website at: <http://safety.ag.utk.edu>.

## Occupational Health Services

It is the responsibility of every Lab Supervisor to promptly contact EHS when a suspected exposure to hazardous materials has occurred. The Lab Supervisor will provide details of the exposure, including the identity of the material, a description of the conditions under which the exposure occurred, a description of the signs and symptoms of the exposure, and the Safety Data Sheet (MSDS/SDS).

In the event of serious adverse symptoms or injury, medical attention should be sought prior to notification of EHS by calling 911. When the need is not immediate, EHS will advise exposed personnel to contact Occupational Health by following these steps:

1. Contact CorVel Corp. (contracted Workman's Compensation group) at 1-866-245-8588 for a health consultation/triage and to obtain a claim number and further instructions regarding medical evaluation.
2. Complete the UT Report of On-the-Job Injury or Illness form and remit to Risk Management as soon as possible. Additional information may be found at <http://riskmanagement.tennessee.edu> or by contacting (865) 974-5409.
3. Notify the Environmental Health and Safety Office at [ehs@utk.edu](mailto:ehs@utk.edu) or (865) 974-5048 as soon as possible so that a follow-up assessment of the accident/exposure can be scheduled.

In the event of an incident where property damage is sustained, or personnel are injured who are NOT UT employees (e.g., unpaid students or volunteers), the following reporting steps must be taken:

1. Complete the University of Tennessee Report of Occurrence form and remit to Risk Management as soon as possible. Additional information may be found at <http://riskmanagement.tennessee.edu> or by contacting 865-974-5409.
2. Notify the Environmental Health and Safety Office at [ehs@utk.edu](mailto:ehs@utk.edu) or 865-974-5048 as soon as possible so that a follow-up assessment of the accident/exposure can be scheduled.

## Training and Information

All individuals working or performing research in laboratories are required to participate in safety training

relevant to the work and risks pertinent to their research.

All undergraduate students who will be taking courses that include a laboratory component will receive safety training from their instructor or EHS staff.

All students, laboratory staff and visiting scholars working in a research laboratory must take general laboratory safety training initially with a recommended refresher after three years.

Depending on the nature of the research and the hazards present in the laboratory, additional laboratory-specific training must be taken. Successful completion of training must be documented before individuals start working or performing research in the laboratory and again anytime new hazards or procedures are introduced.

The PI or a designated laboratory representative will be responsible for providing laboratory specific training. This training must include special handling and documentation procedures for each type of hazard present, specific operating procedures for laboratory equipment and experiments, PPE required for the work area and emergency procedures.

EHS is available to coordinate with instructors to prepare training programs for teaching laboratories.

## **Recordkeeping**

The following records shall be maintained as part of this program:

### **Training**

- General Lab Safety Training
- Specific Lab Safety Training

### **Written hazard assessments**

Hazard assessments to cover any hazardous materials and/or hazardous procedures in the lab

### **Standard Operating Procedures**

The OSHA Laboratory Standard requires that Chemical Hygiene Plans include specific elements and measures to ensure employee protection in the laboratory. One such requirement is Standard Operating Procedures (SOP's) "relevant to safety and health considerations to be followed when laboratory work involves the use of hazardous chemicals."

### **Chemical Inventories**

Annual chemical inventories must be compiled and maintained for each lab with hazardous chemicals.

### **Retention**

These records shall be maintained for at least three years in accordance with safety procedure GS 43: Records Retention for Safety, Health, and Environmental Protection, found in the safety manual.

The PI or supervisor is responsible for maintaining the lab- or shop-specific safety training documentation, SOPs, and written hazard assessments as listed above. A copy of each lab's chemical inventory is maintained by through campus resources (Facilities Services, EHS, or OIT).

## **References**

29 CFR 1910.1450 Laboratory Standard

29 CFR 1910.1200 Hazard Communication Standard

University of Tennessee Code of Conduct

SA0100 Safety and Environmental Health Program

UTK EHS Safety Manual

UTK Laboratory Safety Manual and Chemical Hygiene Program (under development)

## **Disclaimer**

The information provided in these guidelines is designed for educational use only and is not a substitute for specific training or experience.

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