University of California
Agriculture and Natural Resources

Laboratory and Research Safety Manual

UC ANR Environmental Health and Safety Department

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Revision Date – October 2018

Purpose

The purpose of this manual is to support safe and productive research activities at University of California Agriculture and Natural Resources (UC ANR) facilities and in all projects that are conducted on behalf of UC ANR.

Scope and Applicability

This manual has been prepared by the UC ANR Environmental Health and Safety (EH&S) Department for use by research staff at UC ANR Research and Extension Centers (RECs) and UC Cooperative Extension (CE) offices. This manual also applies to many aspects of UC ANR-sponsored research projects at non-UC sites. Research conducted on a UC campus (or facilities owned and operated by that campus) should be conducted as specified by local campus authorities with this manual serving as a secondary reference applicable primarily in UC ANR facilities.

The typical UC ANR work location reflects the resources and missions of cooperative extension and is diverse in personnel as well as research venues. The regulations in this manual apply primarily to university employees and other employed persons conducting research on behalf of the university. The *principles and guidelines* presented in this manual are intended to apply to the broader UC ANR workforce and outreach network that is involved in UC ANR-sponsored research investigations and operations. The broader UC ANR workforce may include: university employees, county employees, federal employees, temporary employees, students, volunteers, and emeritus retirees.

Specific *policies apply to minors (people under 18 years of age) working on research projects or in laboratories. Those policies are not covered in depth in this manual. If minors are employed or volunteering in research projects outside of established UC ANR youth programs (e.g., 4H) contact EH&S for advising before including minors in research activities or inviting them to work in laboratory or animal research projects. See Appendix 1d for UC policy on minors in labs and shops.*

Research activities may be conducted in laboratories or other technical work locations such as greenhouses, post-harvest facilities, barns, and other animal housing or husbandry facilities. Research activities may also occur in temporary non-lab locations such as offices or conference rooms, at field sites, or in technical work locations such as post-harvest grading and storage facilities or grain/soil/plant processing and storage facilities.

This manual is meant to be modular, some sections may or may not apply to individual research projects and some sections may be more emphasized and developed based on the specific research operations.

The preface and each section of the manual are to be applied as follows:

- Preface (pages i – xi) – This section provides background on the intended purpose, use, and implementation of this manual as well as key rights and responsibilities as they apply to research safety at UC ANR.

- Section One – Site Safety and Employee Training Records applies to all employees who routinely enter and work in laboratories or on non-lab research projects that require use of personal protective equipment (PPE) for protection from hazardous exposures covered under specific regulations or the location Injury Illness Prevention Plan.

- Section two – Biosafety and Containment applies to employees who work with, or may be exposed to, biological hazards or regulated biological materials (GMOs, plant pests).

- Section Three – Chemical Hygiene Plan is a chemical safety manual and repository for chemical safety standard operating procedures (SOPs). Information in this section applies to any research or location staff who may have hazardous chemical exposures in labs or research projects.

- Section Four – Radiation, Physical Hazards, and Technical Work Locations applies to employees who have hazardous exposures to physical forces in the course of research. This section of the manual can be used by research staff to document safety information for physical hazards such as radiation sources, hazardous equipment, heat illness, or outdoor field work sites. This section applies to research uses of potentially hazardous industrial/agricultural machinery and vehicles used in research such as tractors, forklift/industrial truck, harvester, shop equipment (grinders, saws), all-terrain vehicles, orchard/picking ladders, pesticide application equipment, pack lines, stills, gins, mechanical threshing operations, and any another pressurized, motorized, or noise-generating equipment used in research. This section can also be used as primary section for safety information for outdoor research activities, field work, and non-lab locations.

- Section Five – Occupational Exposure Assessment and Medical Services applies to all employees who have potential for hazardous exposures in the workplace, that is, all employees covered under the Hazard Communication Standard (8CCR5194), the Chemical Hygiene Standard (8CCR5191), the Aerosol Transmissible Disease Standard (8CCR5199), the Zoonotic Disease Standard (8CCR5199.1), the Illness and Injury Prevention Plan (IIPP), and other state and federal occupational exposure regulations and standards, as applicable.

Required elements of a laboratory/research biological safety plan (8CCR5199)

ELEMENT	SEE PAGE(S)
1. Standard operating procedures designed to address safety and health concerns associated with aerosol-transmissible and zoonotic disease hazards	**2-8**
2. Criteria to be used to identify and implement control measures to reduce exposure (e.g. engineering controls, personal protective equipment)	**2-6, 2-12**
3. Provisions for employee information and training	**1-7, 2-9**
4. Protocol for employer pre-approval for certain laboratory operations, procedures, or activities	**2-2, 2-8**
5. Provisions for medical consultation and examinations	**5-5**
6. The designation of personnel responsible for performing biological risk assessments	**iv – vii, 5-7**
7. Provisions for respiratory protection	**2-6**

Required elements of a chemical hygiene plan (8CCR 5191)

ELEMENT	SEE PAGE(S)
1. Standard operating procedures designed to address safety and health concerns associated with the use of hazardous chemicals in laboratories	**3-12**
2. Criteria to be used to identify and implement control measures to reduce exposure (e.g. engineering controls, personal protective equipment)	**3-9**
3. A requirement to ensure that fume hoods and other protective equipment are functioning properly	**3-10**
4. Provisions for employee information and training	**1-7, 3-13**
5. Protocol for employer pre-approval for certain laboratory operations, procedures, or activities	**3-12**
6. Provisions for medical consultation and examinations	**5-5**
7. The designation of personnel responsible for implementing the chemical hygiene plan, including the assignment of a chemical hygiene officer	**iv - vii**
8. Provisions for additional employee protection for work with particularly hazardous substances(e.g. select carcinogens, reproductive toxins, acutely toxic substances)	**3-7**

Rights and Responsibilities

Employee rights

Employees and other personnel who work in laboratories have the right to be informed about the potential health hazards in their work areas and to be properly trained to work safely with those hazards. This includes custodial staff and other personnel who work to clean and maintain laboratories.

Employees have the right to file a complaint with Cal/OSHA if they feel they are being exposed to unsafe or unhealthy work conditions. An employee cannot be discharged, suspended, or otherwise disciplined by their employer for filing a complaint or exercising these rights. All personnel working with hazardous materials are encouraged to report (anonymously, if preferred) any concerns about unsafe work conditions to the UC ANR Environmental Health and Safety (EH&S) Department online at:
http://ucanr.edu/survey/survey.cfm?surveynumber=1480
or by contacting Brian Oatman, UC ANR Director or Risk and Safety Services (baoatman@ucanr.edu).

Responsibilities of the UC ANR Vice President

- ❑ Implementing the university's environmental health and safety policies at all facilities under UC ANR control. This task has been delegated to UC ANR Risk and Safety Services through the Associate Vice President for Business Operations and the Office of the Controller.

Responsibilities of UC ANR Vice Provost, REC Directors, and County Directors

- ❑ Ensuring that *operations and maintenance of ANR facilities* are in keeping with applicable regulations, UC policy, and published standards for laboratory safety.

Responsibilities of UC Campus Departmental Leadership, Deans, REC Directors, and County Directors

- ❑ Ensuring that *principal investigators (PIs) under their supervision* adhere to applicable regulations, UC policy, and published standards for laboratory safety.

Responsibilities of the UC ANR Environmental Health and Safety (EH&S) Department

- ❑ Updating the ANR laboratory and research safety manual template;
- ❑ Assisting in the development and annual review of location-specific Chemical Hygiene Plan(CHP);
- ❑ Acting as the liaison and coordinator to the laboratory or location safety representative;
- ❑ Acting as the liaison and coordinator for access to UC Campus EH&S and safety representatives;
- ❑ Providing biosafety expertise for preparation of biological risk assessments and biosafety plans;
- ❑ Providing technical guidance in the development and implementation of the Chemical Hygiene Plan;
- ❑ Providing technical guidance in selection of PPE and documenting hazard assessments for PPE;
- ❑ Providing periodic safety reviews of labs and research facilities and reporting findings to REC Directors, County Directors, and UC Campus EH&S departments as appropriate;
- ❑ Providing funding for initial or routine worksite exposure monitoring (in collaboration with PIs).

Responsibilities of Principal Investigator (PI)

For the purposes of this manual, a principal investigator is defined as the individual (or individual co-investigators) who is (are) responsible to the university (and funding agencies) for delivery of research outcomes. The principal investigator or "PI", as the director of the research project, has responsibility for the health and safety of all personnel working in his or her research project who handle hazardous chemicals, biological materials, or physical hazards. The PI may delegate safety duties, but remains responsible for ensuring that delegated safety duties are adequately performed.

The principal investigator is responsible for:

- ❑ Knowing all applicable health and safety rules and regulations, training and reporting requirements and standard operating procedures associated with laboratory safety for regulated substances (chemicals, biologicals, radiation, and physical hazards);
- ❑ Identifying hazardous conditions or operations in the laboratory or other facility containing hazardous materials, determining safe procedures and controls, and implementing and enforcing standard safety procedures;
- ❑ Conducting a formal hazard assessment in order to mitigate the hazards found;
- ❑ Establishing standard safety operating procedures (general and protocol specific) and performing literature searches relevant to health and safety for laboratory-specific work;
- ❑ Ensuring that standard operating procedures (SOPs) and biosafety plans (when required) are written and maintained in the laboratory safety manual.
- ❑ Providing prior-approval for the use of hazardous chemicals in the PI's laboratory;
- ❑ Providing prior-approval for the use of infectious substances (human, animal, or plant pathogens) in the PI's laboratory;
- ❑ Consulting with EH&S on the use of higher risk materials, such as use of particularly hazardous substances or potentially infectious research materials;
- ❑ Maintaining updated inventory of biological materials and chemicals for the laboratory or facility;
- ❑ Ensuring laboratory or other personnel under his/her supervision have access to and are familiar with the appropriate lab safety plans;
- ❑ Training all laboratory or other personnel he/she supervises to work safely with hazardous materials and maintain written records of laboratory-specific or other specialized training in the appropriate Lab Safety Plans and documentation.
- ❑ Promptly notifying EH&S and/or facilities management should he/she become aware that workplace engineering controls (e.g., fume hoods) and safety equipment (e.g., emergency showers/eyewashes, fire extinguishers, etc.) become bypassed, disabled or non-operational;
- ❑ Ensuring the availability of all appropriate personal protective equipment (PPE) which properly fits the wearer (e.g., laboratory coats, gloves, eye protection, etc.), training on the selection, care, use and proper storage, ensuring the PPE is maintained in working order;
- ❑ Promptly reporting accidents and injuries to EH&S. Fatalities and serious injuries MUST be reported to EH&S immediately. Any doubt as to whether an injury is serious should favor reporting;
- ❑ Providing funding for exposure monitoring and medical surveillance and/or medical consultation and examination for laboratory and other personnel, as required;
- ❑ Identifying and minimizing potential hazards to provide a safe environment for repairs and renovations;
- ❑ Informing facilities personnel, other non-laboratory personnel and any outside contractors of potential laboratory-related hazards when they are required to work in the laboratory environment;

Responsibilities of All Personnel Who Handle Hazardous Materials in Research

All personnel who use, handle, or store hazardous materials as part of a research project are responsible for:

- ❑ Annual review of the chemical safety information and requirements including: Chemical Hygiene Plan or Hazard communication plan), as well as review of the appropriate SOPs, safety plans, and policies (as applicable;
- ❑ Annual review of biosafety information and requirements including: Biological Use Authorization, biosafety/containment plan, permit conditions for regulated materials, as well as review of the appropriate SOPs, safety plans, and policies (as applicable);
- ❑ Completing all required health, safety and environmental training and providing written documentation to their supervisor;
- ❑ Following all verbal and written laboratory safety rules, regulations, and standard operating procedures required for the tasks assigned;
- ❑ Following the UCLA Procedures for Safe use of Pyrophoric Liquid Reagents when applicable;
- ❑ Developing good lab hygiene habits, including but not limited to, keeping the work areas safe and uncluttered and not storing or consuming food and drink in research areas where hazardous materials are present;
- ❑ Planning, reviewing, and understanding the hazards of materials and processes in their laboratory research or other work procedures prior to conducting work;
- ❑ Utilizing appropriate measures to control identified hazards, including consistent and proper use of engineering controls, administrative controls, and personal protective equipment;
- ❑ Understanding the capabilities and limitations of personal protective equipment (PPE) issued to them;
- ❑ Consulting with and gaining prior approval from the PI before using biological materials that can cause disease in healthy adults, particularly hazardous substances (PHS), explosives, and other highly hazardous materials or equipment;
- ❑ Immediately reporting all accidents and unsafe conditions to the PI;
- ❑ Participating in the medical surveillance program, when required;
- ❑ Informing the PI of any work modifications ordered by a physician as a result of medical surveillance, occupational injury, or exposure;
- ❑ When working autonomously or performing independent research or work:
  - ❍ Reviewing the plan or scope of work for their proposed research with the PI;
  - ❍ Notifying in writing and consulting with the PI, in advance, if they intend to significantly deviate from previously reviewed procedures (Note: Significant change may include, but is not limited to, change in the objectives, change in PI, change in the duration, quantity, frequency, temperature or location, increase or change in PPE, change in scale, and reduction or elimination of engineering controls.);
  - ❍ Preparing SOPs and performing literature searches relevant to safety and health that are appropriate for their work;
  - ❍ Providing appropriate oversight, training and safety information to laboratory or other personnel they supervise or direct.

Responsibilities of the Location or Laboratory Safety Representative*

*****Please note that the location or laboratory safety representative functions as the default Chemical Hygiene Officer

- ❑ Preparing and reviewing (at least annually) the site-specific Chemical Hygiene Plan and other site-specific documents in the laboratory and research safety manual;
- ❑ Providing guidance and support to the location safety committees;
- ❑ Attending and participating in laboratory safety committee meetings;
- ❑ Providing technical assistance to laboratory workers;
- ❑ Facilitating the implementation of the Chemical Hygiene Plan and assisting in establishing a safe work environment by collaborating with EH&S, faculty, other researchers and lab personnel;
- ❑ Providing guidance on laboratory safety compliance and technical subjects;
- ❑ Coordinating or providing training on occupational health and safety requirements;
- ❑ Serving as a liaison between laboratories and EH&S in helping maintain safety and regulatory information, including Safety Data Sheets (SDS) formerly known as Material Safety Data Sheets (MSDS);
- ❑ Requesting information and clarification on regulatory requirements from EH&S;
- ❑ Assisting EH&S in evaluating program effectiveness;
- ❑ Assisting in responding to any regulatory actions or investigations;
- ❑ Communicating with the director, business officer and faculty on laboratory safety and injury/illness prevention efforts and activity;
- ❑ Participating in the development of the site-specific emergency operations plan;
- ❑ Assisting with emergency management planning and response as needed;

Instructions for Adapting this Manual for your Project or Location.

The manual has five sections covering the primary risk and hazards of concern for research safety and regulatory compliance. Basic information is provided to guide research activities that do not involve any special or unique hazards. Appendices and hyperlinks are provided for template documents and forms that can be used to customize this manual.

Users of this manual are expected to make the following changes and additions to this manual to ensure that it is detailed and accurate enough to serve as a lab-specific or project-specific safety resource:

Section 1 (Site Safety Information and Employee Training Records):

- ☐ Add information about how to access site-specific safety plans.
- ☐ Create a roster of lab users and revise it whenever employees join and leave the lab.
- ☐ Document and retain hazard assessment for each employee who must use PPE in a lab.
- ☐ Document or retain copies of training records for employees.

Section 2 (Biosafety and Containment):

- ☐ Create and implement project-specific biosafety SOPs and associated training records, as needed.
- ☐ Retain copies of current Biological Use Authorizations (BUAs), regulatory permits, and IACUC protocols that apply to the work.
- ☐ Maintain a complete and accurate inventory of cultures and other biological materials (viable samples, animal carcasses) stored for long term use.

Section 3 (Chemical Hygiene Plan):

- ☐ Create and implement project-specific chemical SOPs and associated training records, as needed.
- ☐ Maintain a complete and accurate inventory of chemicals used or stored in research locations.

Section 4 (Physical Hazards, Radiation Safety, and Technical Work Locations):

- ☐ Document and retain any job safety analysis and PPE certifications for physical hazards and technical work locations (may also be kept in Section 1).
- ☐ Retain copies of any critical equipment information or manufacturer instructions, as needed.

Section 5 (Occupational Exposure Assessment and Medical Services):

- ☐ Retain contact information and required service request forms for local occupational health providers.
- ☐ Retain information regarding mandatory and recommended occupational medical services.

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