

## Carcinogens

### STANDARD OPERATING PROCEDURE (SOP)

**Type of SOP:**     Process     Hazardous Chemical     Hazardous Class

All personnel who are subject to these SOP requirements must review a completed SOP and sign the associated training record. Completed SOPs must be kept with the UC Davis Laboratory Safety Manual or be otherwise readily accessible to laboratory personnel. Electronic access is acceptable. SOPs must be reviewed, and revised where needed, as described in the [UC Davis Laboratory Safety Manual](#). Note that not all hazardous chemicals are appropriately addressed in a single control-banded SOP, and some chemicals are subject to several control-banded SOPs. Unique properties of each chemical must be considered before including it into a control band. This SOP is not appropriate for the “Listed” Carcinogens, as described in [8 CCR §5209](#) and controlled by the [Listed Carcinogen SOP template](#).

Date SOP Written:    Click here to enter a date.    Approval Date:    Click here to enter a date.

SOP Prepared by:    REQUIRED - Insert Preparer's Name  
CLSC SOP Task Force

SOP Reviewed and Approved by (name/signature):    REQUIRED - Insert Approver's Name & Signature

Department:    REQUIRED - Insert Department

Principal Investigator/  
Laboratory Supervisor:    REQUIRED - Insert Name    Phone: REQUIRED - Insert Phone#

Lab Manager/  
Safety Coordinator:    REQUIRED - Insert Name    Phone: REQUIRED - Insert Phone#

Emergency Contact(s):    REQUIRED - Insert Name    Phone: REQUIRED - Insert Phone#

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\_\_\_\_\_  
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Location(s)    Building:    REQUIRED - Insert Name    Lab  
covered by SOP:    Room #(s):    REQUIRED - Insert Number    Phone: REQUIRED - Insert Phone#

#### 1. HAZARD OVERVIEW

Carcinogens are chemicals that are known to cause cancer in humans and/or animals, or are suspected of causing cancer. Some of the chemicals used in academic laboratory research,

industrial processes, and daily activities are carcinogenic. Recognition of the hazards associated with the transportation, use, storage, and disposal of these materials is essential. Precautions must be taken to minimize any potential chemical exposure to Carcinogens.

## 2. HAZARDOUS CHEMICAL(S)/CLASS OF HAZARDOUS CHEMICAL(S)

Carcinogens are chemicals that are capable of causing cancer or tumor development, typically after repeated or chronic exposure. Their effects may only become evident after a long latency period and may cause no immediate harmful effects.

Carcinogens regulated by the California Occupational Safety and Health Administration (Cal/OSHA) can be found in [Title 8 of California Code of Regulations \(8 CCR\), Article 110](#), §5200-5220.

Additionally, Cal/OSHA defines Carcinogens in [8 CCR §5191](#) as materials that meet any of the following:

1. Is a regulated Cal/OSHA carcinogen;
2. Is listed as “known to be carcinogens” in the National Toxicology Program (NTP) [Annual Report on Carcinogens](#);
3. Is listed as Group 1 (“carcinogenic to humans”) by the International Agency for Research on Cancer (IARC) [Monographs](#); or
4. Is listed in either Group 2A (“probably carcinogenic to humans”) or 2B (“possibly carcinogenic to humans”) by IARC or under the category, “reasonably anticipated to be carcinogens” by NTP, and causes statistically significant tumor incidence in experimental animals under defined conditions (see [8 CCR §5191](#) for more details).

Carcinogens can be identified in the Globally Harmonized System by the Hazard Codes H350 (May cause cancer) and H351 (Suspected of causing cancer). Some common examples of UC Davis laboratory Carcinogens include:

1. Arsenic and Arsenic compounds (inorganic)
2. Benzene
3. Cadmium and Cadmium compounds
4. Chromium (VI) compounds
5. Cobalt and Cobalt compounds
6. Dichloromethane
7. Formaldehyde
8. Lead and Lead compounds (inorganic)
9. Nickel compounds
10. Polycyclic Aromatic Hydrocarbons (PAHs)

Also in lab: basic fuschin, tryptan blue, chloroform, Bouin's solution, 1,4-Dichlorobenzene

Note, many carcinogens have additional chemical hazards. Review a current Safety Data Sheet for each carcinogen prior to use.

REQUIRED - List (or attach) the applicable chemical(s) for your laboratory, and describe important properties and signs/symptoms of exposure.

## 3. ENGINEERING/VENTILATION CONTROLS

Use available engineering/ventilation controls to keep exposure to Carcinogens as low as possible. The following is a general plan for Carcinogens:

- A. Use containment devices (*e.g.*, chemical fume hoods, glove boxes, localized exhaust (“snorkel”), etc.) when:
  - i. Using volatile and/or semi-volatile substances;
  - ii. Manipulating substances that may generate aerosols; and
  - iii. Performing laboratory procedures that may result in an uncontrolled release.
- B. Use high-efficiency particulate air (HEPA) filters, carbon filters, or scrubber systems with containment devices to protect effluent and vacuum lines, pumps, and the environment whenever feasible.
- C. Ventilated containment should be used to weigh out solid chemicals (*e.g.*, ventilated balance safety enclosure, etc.). Alternatively, the tare method can be used to prevent inhalation of the chemical. While working in a fume hood, the chemical is added to a pre-weighed container. The container is then sealed and can be re-weighed outside of the fume hood. If a chemical needs to be added or removed, this manipulation is carried out in the fume hood. In this manner, all open chemical handling is conducted in the fume hood.

If you must use Carcinogens without/outside of engineering or ventilation controls, you must contact the Chemical Hygiene Officer or [healthandsafety@ucdavis.edu](mailto:healthandsafety@ucdavis.edu) for an exposure assessment. Formaldehyde use in anatomy, histology and pathology laboratories must be evaluated by EH&S to ensure airborne concentrations of formaldehyde are below the Action Level of 0.5 parts per million by volume.

REQUIRED - Insert descriptions of lab-specific ventilation controls and equipment safety features utilized to reduce the risk of Carcinogen chemical exposures.

#### 4. ADMINISTRATIVE CONTROLS

The following elements are required:

1. Complete the [UC Laboratory Safety Fundamentals](#) (or approved equivalent) training prior to working in the laboratory;
2. Complete laboratory-specific safety orientation and training on laboratory-specific safety equipment, procedures, and techniques to be used, including any applicable laboratory-specific Laboratory Safety Plan(s), prior to receiving unescorted access to the laboratory;
3. Demonstrate competency to perform the procedures to the Principal Investigator (PI), Laboratory Supervisor, laboratory-specific Safety Officer, and/or trainer;
4. Be familiar with the location and content of any applicable Safety Data Sheets (SDSs) for the chemicals to be used (online SDSs can be accessed from [UC SDS](#));
5. Implement good laboratory practices, including good workspace hygiene;
6. Inspect all equipment and experimental setups prior to use;
7. Follow best practices for the movement, handling, and storage of hazardous chemicals (see Chapters 5 and 6 of [Prudent Practices in the Laboratory](#) for more detail). An appropriate spill cleanup kit must be located in the laboratory. Chemical and hazardous waste storage must follow an appropriate segregation scheme and include appropriate labeling. Hazardous chemical waste must be properly labelled, stored in closed containers, in secondary containment, and in a designated location;
8. Do not deviate from the instructions described in this SOP without prior discussion and approval from the PI and/or Laboratory Supervisor.

9. Notify the PI and/or Laboratory Supervisor of any accidents, incidents, near-misses, or upset condition (e.g., unexpected rise or drop in temperature, color or phase change, evolution of gas) involving Carcinogens described in this SOP; and
10. Abide by the laboratory-specific working alone SOP, if applicable.

For Carcinogens, the following are also required:

11. Adhere to the UC Davis Carcinogen Program described in the [Chemical Carcinogen Safety Manual](#) and [SafetyNet #32](#);
12. Work surfaces should be protected (e.g., disposable absorbent bench paper, aluminum foil, etc.) and must be decontaminated after each use;
13. All waste containing Carcinogen materials at greater than 0.001% wt., including preserved tissue samples, must be disposed as hazardous waste; and
14. This SOP is **not** meant to address [8 CCR §5209](#) "Listed" Carcinogens. If you are using one of these materials you must develop a separate [Listed Carcinogens SOP](#).

REQUIRED - Insert the laboratory-specific restrictions on maximum quantities to be used and stored.

REQUIRED - Insert descriptions of any special handling or storage requirements.

INSERT IF APPLICABLE - Describe any chemical exposure monitoring and medical surveillance requirements, as determined by the Chemical Hygiene Officer.

INSERT IF APPLICABLE - Describe any additional administrative controls (e.g., restrictions on procedure/work equipment/work locations/unattended operations). Include any chemical-specific administrative controls (e.g., peroxide formers).

## 5. PERSONAL PROTECTIVE EQUIPMENT (PPE)

At a minimum, long pants (covered legs) and closed toe/closed heel shoes (covered feet) are required to enter a laboratory or technical area where hazardous chemicals are used or stored.

In addition to the minimum attire required upon entering a laboratory, the following PPE are required for work with Carcinogens:

- A. Eye Protection: Eye protection is required for all work with Carcinogens.
  - i. At a minimum ANSI Z87.1-compliant safety glasses are necessary.
  - ii. Splash goggles may be substituted for safety glasses, and are required for processes where splashes are foreseeable or when generating aerosols.
  - iii. Ordinary prescription glasses will NOT provide adequate protection unless they also meet the Z87.1 standard and have compliant side shields.
- B. Body Protection: At a minimum a chemically-compatible laboratory coat that fully extends to the wrist is necessary.
  - i. If a risk of fire exists, a flame-resistant laboratory coat that is NFPA 2112-compliant should be worn.
  - ii. For chemicals that are corrosive and/or toxic by skin contact/absorption additional protective clothing (e.g., face shield, chemically-resistant apron, disposable sleeves, etc.) are required where splashes or skin contact is foreseeable.
- C. Hand Protection: Hand protection is needed for the activities described in this SOP. Define the type of glove to be used based on: A) the chemical(s) being used, B) the anticipated

chemical contact (*e.g.*, incidental, immersion, etc.), C) the manufacturers' permeation/compatibility data, and D) whether a combination of different gloves is needed for any specific procedural step or task.

REQUIRED - Insert descriptions of PPE and hygiene practices used with the Carcinogens described in this SOP. Include any specialized PPE needed for a procedural step/task.

## 6. SPILL AND EMERGENCY PROCEDURES

Follow the guidance for chemical spill cleanup from [SafetyNet #13](#) and/or the [UC Davis Laboratory Safety Manual](#), unless specialized cleanup procedures are described below. Emergency procedure instructions for the UC Davis campus and UCD Medical Center are contained in the [UC Davis Laboratory Safety Manual](#) and the [Emergency Response Guide](#) (which must be posted in the laboratory). All other locations must describe detailed emergency procedure instructions below.

For spills of solid materials, DO NOT dry sweep.

REQUIRED - Insert descriptions of any specialized spill clean up procedures for hazardous chemicals used in this SOP (*e.g.*, hydrofluoric acid, pyrophorics, phenol, etc.). Additional details of lab-specific spill cleanup should be provided if applicable.

INSERT IF APPLICABLE - Descriptions of any specialized emergency procedures for locations outside of the UC Davis main campus and the UCD Medical Center campus.

EH&S **must be notified immediately** for any uncontrolled release of Carcinogens; please call (530) 752-1493. Some examples of an uncontrolled release include, but are not limited to, equipment failure, rupture of containers, or failure of control equipment. EH&S must report this information to Cal/OSHA within 24 hours.

## 7. WASTE MANAGEMENT AND DECONTAMINATION

Hazardous waste must be managed according to [Safety Net #8](#) using the appropriate [label](#). In general, hazardous waste must be removed from your laboratory within 9 months of the accumulation start date; refer to the [timeline for waste disposal](#). Hazardous waste pick up requests must be [completed online](#).

REQUIRED - Insert descriptions of laboratory-specific information on the waste streams generated, storage location, and any special handling/storage requirements.

Decontamination procedures vary depending on the material being handled. Carefully inspect work areas to make sure no hazardous materials remain. Following dispensing or handling, all surfaces and equipment should be wiped with the appropriate cleaning agent to prevent accumulation of Carcinogen chemical residue. Dispose of cleaning materials properly. Be sure all ignition sources are secured before beginning clean up with flammable liquids. Decontaminate vacuum pumps or other contaminated equipment before removing them from the regulated area or before resuming normal laboratory work in the area.

REQUIRED - Insert descriptions of decontamination procedures for equipment, glassware, and controlled areas (*e.g.*, glove boxes, restricted access hoods, perchloric/hot acid fume hoods, or designated portions of the laboratory).

Upon completion of work with Carcinogens and/or decontamination of equipment, remove gloves and/or PPE to wash hands and arms with soap and water. Additionally, upon leaving a designated

Carcinogen work area remove all PPE worn and wash hands, forearms, face and neck as needed. Contaminated clothing or PPE should not be worn outside the lab. Soiled lab coats should be sent for professional laundering. Grossly contaminated clothing/PPE and disposable gloves must not be reused.

**8. DESIGNATED AREA**

Designated area(s) for the use and storage of Carcinogens shall be established where limited access, special procedures, knowledge, and work skills are required. Signage indicating the materials being used and/or stored and the applicable hazards should be easily visible for the designated work space and/or storage area, for example: DANGER! CARCINOGEN WORK AREA!

REQUIRED - Insert description(s) of the designated area(s) for Carcinogens in your laboratory, which is required for Carcinogens. The entire laboratory, a portion of the laboratory, a fume hood, etc. can be designated.

**9. DETAILED PROTOCOL**

REQUIRED - Insert or attach detailed laboratory-specific procedures for the process, hazardous chemical(s), or hazard class. You may also include any relevant supporting resources such as SafetyNets, journal citations, etc. that are applicable.



