



SACRAMENTO
STATE

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 readily accessible to laboratory personnel. Electronic access is acceptable. SOPs must be reviewed, and revised where needed, as described in the [CSUS Chemical Hygiene Plan](#). 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 a Listed Carcinogen SOP template.

Date SOP Written: _____ Approval Date: _____

SOP Prepared by: _____
NSM Safety Manager

SOP Reviewed and Approved by (name/signature): _____

Department: _____

Laboratory Supervisor: _____ Phone: _____

Lab Manager/
Safety Coordinator: _____ Phone: _____

Emergency Contact(s): _____ Phone: _____

Location(s) Building: _____ Lab
covered by SOP: Room #(s): _____ 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 a substance or agent that meets one of the following criteria:

1. It is a regulated Cal/OSHA Carcinogen.
2. It is listed as “known to be carcinogens” in the National Toxicology Program (NTP) [Annual Report on Carcinogens](#)
3. It is listed as Group 1 (“carcinogenic to humans”) by the International Agency for Research on Cancer (IARC) [Monographs](#); or
4. It 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 CSUS 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

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

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 CSUS EH&S 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.

4. ADMINISTRATIVE CONTROLS

The following elements are required:

1. Complete the [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 prior to receiving unescorted access to the laboratory;
3. Demonstrate competency to perform the procedures to the 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 [MSDSonline](#));
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 department or college-specific working alone policy, if applicable.
11. Where feasible, work surfaces should be protected (*e.g.*, disposable absorbent bench paper, aluminum foil, etc.) and must be decontaminated after each use;
12. All waste containing Carcinogen materials at greater than 0.001% wt., including preserved tissue samples, must be disposed as hazardous waste;

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. 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.

6. SPILL AND EMERGENCY PROCEDURES

Follow the guidance for chemical spill cleanup from the [CSUS Chemical Hygiene Plan](#), unless specialized cleanup procedures are described below. Emergency procedure instructions for CSUS campus are contained in the [campus Emergency Response Manual \(ERM\)](#) and in building specific Emergency Action Plans. The emergency exit route 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. Dry sweeping can result in the hazardous material becoming airborne.

EH&S must be notified immediately for any uncontrolled release of Carcinogens; please call (916) 278-2020. 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 24hours.

7. WASTE MANAGEMENT AND DECONTAMINATION

Hazardous waste must be managed according to [the CSUS Chemical Hygiene Plan](#), and must be [properly labeled](#). In general, hazardous waste must be removed from your laboratory within 9 months of the accumulation start date. Hazardous waste pick up requests must be completed through the RSS WASTE application or EH&S at (916) 278-5165 or (916) 278-2020.

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**

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. 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!

9. DETAILED PROTOCOL

Documentation of Standard Operating Procedure Training

(Signature of all users is required)

- ✓ Prior to using **Carcinogens**, laboratory personnel must be trained on the hazards described in this SOP, how to protect themselves from these hazards, and emergency procedures.
- ✓ Ready access to this SOP and to a Safety Data Sheet for each hazardous material described in the SOP must be made available.
- ✓ The Laboratory Supervisor must ensure that their laboratory personnel have attended appropriate laboratory safety training or refresher training within the last three years.
- ✓ Training must be repeated following **any** revision to the content of this SOP. Training must be documented. This training sheet is provided as one option; other forms of training documentation (including electronic) are acceptable but records must be accessible and immediately available upon request.

Designated Trainer: *(signature is required)*

I have read and acknowledge the contents, requirements, and responsibilities outlined in this SOP:

Name	Signature	Trainer Initials	Date