**Carcinogens**

**STANDARD OPERATING PROCEDURE (SOP)**

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

**All personnel subject to these SOP requirements must review a completed SOP and sign the associated training record. Completed SOPs must be kept in the laboratory’s safety binder or be otherwise readily accessible to laboratory personnel. Electronic access is acceptable. SOPs must be reviewed, and revised where needed, as described in the** [**SJSU Chemical Hygiene Plan**](https://www.sjsu.edu/fdo/departments/ehs/lab/Chemical_Hygiene_Plan.pdf)**. Note that not all hazardous chemicals are appropriately addressed in a single Hazard Class SOP, and some chemicals are subject to several Hazard Class SOPs. This SOP is not appropriate for the “Listed” Carcinogens, as described in** [**8 CCR §5209**](https://www.dir.ca.gov/title8/5209.html)**.**

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| Date SOP Written: | |  | |  | Approval Date: | | |  |
| SOP Prepared by: | | **REQUIRED - Insert Preparer's Name** | | | | | | |
| 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#** | | |
| Emergency Contact(s): | | **REQUIRED - Insert Name** | | | | Phone: | **REQUIRED - Insert Phone#** | | |
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| Location(s) covered by SOP: | Building: | | **REQUIRED - Insert Name** | | | Lab Phone: | **REQUIRED - Insert Phone#** | | |
| Room #(s): | | **REQUIRED - Insert Number** | | |

1. **HAZARD OVERVIEW**

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.

1. **HAZARDOUS CHEMICAL(S)/CLASS OF HAZARDOUS CHEMICAL(S)**

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](https://www.dir.ca.gov/title8/sb7g16a110.html), §5200-5220. Additionally, Cal/OSHA defines Carcinogens in [8 CCR §5191](http://www.dir.ca.gov/title8/5191.html) 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](http://ntp.niehs.nih.gov/pubhealth/roc/index.html);
3. Is listed as Group 1 (“carcinogenic to humans”) by the International Agency for Research on Cancer (IARC) [Monographs](http://monographs.iarc.fr/ENG/Classification/); 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](http://www.dir.ca.gov/title8/5191.html) 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 SJSU 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)

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. The chemical’s Safety Data Sheet (SDS) and [PubChem](https://pubchem.ncbi.nlm.nih.gov/)’s Laboratory Chemical Safety Sheet (LCSS) are excellent sources for this information. The [California Prop 65 list](https://oehha.ca.gov/proposition-65/proposition-65-list) can be used to identify Carcinogens in your chemical inventory, though this list should not be considered exhaustive.

1. **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:

1. Use containment devices (e.g. chemical fume hoods, glove boxes, localized exhaust, etc.) when:
   1. Using volatile and/or semi-volatile substances;
   2. Manipulating substances that may generate aerosols; and
   3. Performing laboratory procedures that may result in an uncontrolled release.
2. The tare method should be used to prevent inhalation of the chemical if weighing Carcinogens in a containment device is not feasible. To do this, the Carcinogen is added to a pre-weighed container, while working inside the fume hood. 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 [ehs@sjsu.edu](mailto:ehs@sjsu.edu?subject=Carcinogens%20air%20monitoring%20request) for an exposure assessment.

**REQUIRED:** Describe the lab-specific engineering or ventilation controls and equipment safety features (if applicable) that will be used to reduce the risk of chemical exposures to Carcinogens.

1. **ADMINISTRATIVE CONTROLS**

The following elements are required:

1. Complete laboratory safety 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 the location of laboratory safety equipment (emergency eyewash, safety shower, fire extinguisher);
3. Demonstrate competency to perform the procedures described in this SOP to the Principal Investigator (PI) or trainer;
4. Be familiar with the location and content of any Safety Data Sheets (SDSs) for the chemicals used (online SDSs are available from [MSDS online](https://msdsmanagement.msdsonline.com/8511b604-100d-449a-9a6b-366eff19da04/ebinder/?nas=True));
5. Inspect all equipment and experimental setups prior to use;
6. Follow best practices for the movement, handling, and storage of hazardous chemicals (see Chapters 5 and 6 of [Prudent Practices in the Laboratory](http://ucanr.edu/sites/ucehs/files/133892.pdf) 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;
7. Do not deviate from the instructions described in this SOP without prior discussion and approval from the PI; and
8. Notify the PI of any accidents, incidents, near-misses, or unexpected outcomes involving the Carcinogens described in this SOP.

For Carcinogens, the following are also required:

1. All waste containing Carcinogen materials at greater than 0.001% wt., including preserved tissue samples, must be disposed as hazardous waste; and
2. This SOP is ***not*** meant to address [8 CCR §5209](https://www.dir.ca.gov/title8/5209.html) “Listed” Carcinogens. These chemicals cannot be used or stored at SJSU due to the necessary facilities and equipment required by the regulations governing them.

**REQUIRED:** Insert the laboratory-specific restrictions on maximum quantities to be used or stored, including any special handling or storage requirements.

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

1. **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:

1. **Eye Protection** (must be ANSI Z87.1-compliant)**:**
   1. At a minimum safety glasses are necessary.
   2. Splash goggles may be substituted for safety glasses, and are required for processes where splashes are foreseeable or when generating aerosols.
   3. Ordinary prescription glasses are not acceptable eye protection and cannot be used in lieu of proper safety eyewear.
2. **Body Protection**: At a minimum a chemically-compatible laboratory coat that fully extends to the wrist is necessary. A chemically-compatible lab coat may be substituted for other types of body protection (e.g. apron, disposable sleeves, etc.) so long as the substituted protection provides similar or better protection to the researcher.
   1. If a risk of fire exists, a flame-resistant laboratory coat that is NFPA 2112-compliant should be worn.
   2. 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.
3. **Hand Protection**: Hand protection is needed for the activities described in this SOP. Define the type of glove to be used based on:
   1. The chemical(s) being used;
   2. The anticipated chemical contact (e.g. incidental, immersion, etc.);
   3. The manufacturers’ permeation/compatibility data; and
   4. Whether a combination of different gloves is needed for a specific procedural step/task.

**REQUIRED:** Insert lab-specific descriptions of PPE and hygiene practices used with Carcinogens, including any specialized PPE needed for a procedural step or specific task.

1. **SPILL AND EMERGENCY PROCEDURES**

Do not attempt to clean up a chemical spill unless you have been trained and feel comfortable doing so. Contact the College Safety Team or Environmental Health & Safety (EH&S), for help with cleaning up a small chemical spill. For a large spill of Carcinogens, confine the spill within the fume hood or room, evacuate everyone from the lab, and call 911 (or 408-924-2222 from a non-campus phone).

For spills of solid materials, DO NOT dry sweep.

**REQUIRED:** Insert description of who to call in case of Carcinogen spill in the lab.

EH&S **must be notified immediately** for any uncontrolled release of Carcinogens; please call (408)-924-1969. 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 within 24 hours.

1. **WASTE MANAGEMENT AND DECONTAMINATION**

**Waste Management:**

Hazardous waste must be managed as outlined in [SJSU’s Chemical Hygiene Plan](https://www.sjsu.edu/fdo/departments/ehs/lab/Chemical_Hygiene_Plan.pdf), and must be [properly labeled](http://www.science.sjsu.edu/safety/HazWasteForm.pdf). In general, hazardous waste must be removed from your laboratory within nine months of the accumulation start date.

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

**Decontamination:**

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.

**REQUIRED:** Insert description(s) of decontamination procedures for equipment, glassware, and/or controlled areas (e.g. gloveboxes, restricted access hoods, or designated portions of the laboratory).

Upon completion of work with Carcinogens and/or decontamination of equipment, remove gloves and wash hands with soap and water. Upon leaving the laboratory or designated Carcinogen work area, remove all PPE worn and wash hands and forearms as needed. Contaminated PPE should not be worn outside of the laboratory. Soiled lab coats should be sent for professional laundering. Grossly contaminated clothing/PPE, and disposable gloves must not be reused and should be disposed of as hazardous waste.

1. **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 corresponding [Globally Harmonized System (GHS) pictogram(s)](https://www.osha.gov/Publications/HazComm_QuickCard_Pictogram.html) should be visible at the entrance of the designated area (e.g. postings on the exterior of the laboratory door).

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

1. **DETAILED PROTOCOL**

**REQUIRED:** Insert the lab-specific protocol for the process, hazardous chemical(s), or hazard class described in this SOP. Include any relevant resources such as journal articles, patents, etc. as desired.

**TEMPLATE REVISION HISTORY**

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| --- | --- | --- | --- |
| **Version** | **Date Implemented** | **Author** | **Revision Notes:** |
| **1.0** | **4/3/2020** | **Alexi Ball-Jones** | **New template** |
| **1.1** | **10/27/2020** | **Alexi Ball-Jones** | **Updated hyperlinks** |
| **1.2** | **5/11/2021** | **Alexi Ball-Jones** | **Added** [**ehs@sjsu.edu**](mailto:ehs@sjsu.edu) **link** |
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**LAB-SPECIFIC REVISION HISTORY**

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| --- | --- | --- | --- |
| **Version** | **Date Approved** | **Author** | **Revision Notes:** |
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**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 Principal Investigator (PI), or the Laboratory Supervisor if the activity does not involve a PI, 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:

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| --- | --- | --- | --- |
| **Name** | **Signature** | **Trainer Initials** | **Date** |
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