**Administrative Information**

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| School |  | Department |  |
| PI name |  | PI email |  |
| Lab manager name (if applicable) |  | Lab manager email (if applicable) |  |
| Locations covered by this SOP (buildings/rooms) |  | | |
| SOP version number |  | SOP approval date |  |
| Reviewed and approved by (name) |  | Reviewed and approved by (initials) |  |
| **Emergency contact name** |  | **Emergency contact phone\*** |  |
| Secondary emergency contact name |  | Secondary emergency contact phone\* |  |
| \* Provide emergency contact phone numbers that will be active both during normal work hours and after hours, e.g., personal mobile phone. Alternatively, give separate daytime and after-hours numbers for both contacts. | | | |

SOP Requirements

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| **Instructions Document** | You are responsible for reading the [SOP Instructions](https://tiny.cc/usc-sop-instructions) outlining roles, responsibilities, and other important safety information. In addition, you must include that document as part of your records. |
| **Recordkeeping** | Acknowledgement forms for this SOP and any associated training are included at the end of this document. Additional copies of the forms are available online ([SOP Acknowledgement](https://tiny.cc/usc-sop-acknowledgement), [Internal Training Record](https://tiny.cc/usc-sop-training)). |
| **Customization** | It is intended that personnel add lab-specific information to the SOP template to produce a finished and functional SOP. Suggested places to add customization are highlighted in yellow throughout the document. |

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| Standard (Safe) Operating Procedure: carcinogens | |
| **Nature of Hazard** | “*Carcinogen means a substance or a mixture of substances which induce cancer or increase its incidence. Substances and mixtures which have induced benign and malignant tumors in well-performed experimental studies on animals are considered also to be presumed or suspected human carcinogens unless there is strong evidence that the mechanism of tumor formation is not relevant for humans.*” ([29 CFR §1910.1200 Appendix A](https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10100))  Carcinogens directly or indirectly damage DNA in cells, causing an increased probability of cancer. Precancerous cellular damage is generally symptomless, and in the event it progresses to cancer, it usually does so after a long induction period (years to decades). Not all damage can be repaired by the body and the level of residual irreversible damage will increase with each exposure. Thus, carcinogens are principally a chronic health hazard.  Carcinogens act on the body by all routes of exposure (absorption through skin/eyes/mucous membranes, injection under skin, ingestion, inhalation as dust, droplets, or vapor). |
| **Hazard Identification** | Refer to Section 6 of the [Chemical Hygiene Plan (CHP)](http://tiny.cc/chem-hygiene-plan) for details of the OSHA/GHS hazard classification system. **All personnel who agree to abide by this SOP are required to familiarize themselves with the contents of Section 6 of the CHP.**  For purchased chemicals, identification as a carcinogen should be made by assessing hazard information given in the safety data sheet (SDS) against the criteria given in the CHP subsection *Particularly Hazardous Substances* (towards the end of Section 6). If the SDS does not list the material as carcinogenic, the material may still be a carcinogen according to:   * [California Proposition 65](https://oehha.ca.gov/proposition-65/proposition-65-list). Check the official list to confirm. * International Agency for Research on Cancer ([IARC](https://monographs.iarc.who.int/agents-classified-by-the-iarc/))   For synthesized chemicals, please refer to CHP subsection *Particularly Hazardous Substances* for pointers as to when carcinogenicity may be suspected or assumed.  Any mixture containing a carcinogen at a concentration of 0.1% or more by mass shall be handled as a carcinogen. For carcinogens known to be highly potent (e.g., the 13 particularly severe carcinogens listed below), mixtures containing any quantity should be assumed carcinogenic. |
| **Regulated Carcinogens** | **Special regulatory conditions apply to 13 severe carcinogens (**[**8 CCR §5209**](http://www.dir.ca.gov/title8/5209.html)**). Contact** [**labsafety@usc.edu**](mailto:labsafety@usc.edu) **in advance of purchasing or using the substances** (or their salts, in the case of amines) **in the following list:**  2-Acetylaminofluorene [CAS 53-96-3] 4-Aminodiphenyl\* (4-aminobiphenyl) [CAS 92-67-1] Benzidine (and its salts) [CAS 92-87-5] 3,3'-Dichlorobenzidine (and its salts) [CAS 91-94-1] 4-(Dimethylamino)azobenzene\* [CAS 60-11-7] alpha-Naphthylamine\* (1-naphthylamine) [CAS 134-32-7] beta-Naphthylamine\* (2-naphthylamine) [CAS 91-59-8] 4-Nitrobiphenyl [CAS 92-93-3] *N*-Nitrosodimethylamine [CAS 62-75-9] *beta*-Propiolactone [CAS 57-57-8] Bis(chloromethyl) ether [CAS 542-88-1] Methyl chloromethyl ether [CAS 107-30-2] Aziridine\* (ethyleneimine) [CAS 151-56-4].  \* Salts of these amines are not specifically mentioned in [8 CCR §5209](http://www.dir.ca.gov/title8/5209.html), but shall be considered equally as hazardous and regulated as the free amines. |
| **PHS** | Carcinogens are considered *Particularly Hazardous Substance* (PHS) by Cal-OSHA ([8 CCR §5191 (e) (H)](https://www.dir.ca.gov/title8/5191.html)). PHS must be handled with special care. Refer to the [CHP](http://tiny.cc/chem-hygiene-plan) (Sections 6 and 8[[1]](#footnote-1)) for more information on the classification and identification of PHS, and safe practices for working with these materials. |
| **Specific Substances** | [Add details of specific substances you will be using in the lab under this SOP. If you intend to use highly potent carcinogens or any of the 13 regulated carcinogens (see above list), contact [labsafety@usc.edu](mailto:labsafety@usc.edu) for guidance.] |
| **Designated Work Areas/ Signage** | For low-hazard work with carcinogens (e.g., weak carcinogens, or very low concentrations), the lab may be considered the designated area provided the lab door sign includes appropriate warning pictograms. More hazardous work with carcinogens should be done at designated areas within the lab (e.g., a fume hood) which should be signed “Warning — Carcinogen area” (or equivalent wording). If highly hazardous work is being performed, additional signage giving the name of the responsible individual and contact number is also recommended.  [Add lab-specific work area and signage information here, if needed.] |
| **Unattended Experiments** | Unattended hazardous experiments should be signed according to the requirements of the [Unattended Experiments Fact Sheet](https://tiny.cc/usc-unattended-operations). |
| **Storage Requirements** | Carcinogens should be stored in labeled secondary containment (e.g., polypropylene trays). Carcinogens shall not be stored under sinks. They should be stored below eye level and upright in a well-ventilated area out of direct sunlight. Keep carcinogens segregated from incompatible materials (e.g., flammable carcinogens shall not be stored with oxidizers, water reactive materials, or pyrophorics). Extremely potent carcinogens and carcinogens which are also highly toxic should be segregated away from other materials and stored in closed secondary containment if possible.  Refer to the [CHP](http://tiny.cc/chem-hygiene-plan) (Section 7) for further information on storage and inventory-keeping requirements. |
| **Labeling** | Carcinogenic materials not in active use shall be labelled to indicate the hazard. Label carcinogen storage cabinets and secondary containment by the words “Danger! Carcinogen”. Label templates are available at the [Chemical Labeling and Signage](http://tiny.cc/usc-chm-lbl-sign) web page. Refer to [CHP](http://tiny.cc/chem-hygiene-plan) (Section 5) for detailed requirements on hazardous materials labeling. |
| **Personal Protective Equipment** | Appropriate PPE shall be worn for all work with hazardous materials, in accordance with the USC [Minimum Standard](https://tiny.cc/usc-ppe-standard), [CHP](http://tiny.cc/chem-hygiene-plan), and [fact sheets](https://tiny.cc/usc-ehs-fact-sheets). Most commonly, research lab PPE consists of a lab coat, eye protection (safety glasses; goggles required if there is a splash hazard) and chemical protective gloves. A face shield may be needed in addition to goggles for severe splash hazards. Note that for reasons of safety and regulatory compliance, respirator usage is NOT permitted outside of the [USC Respiratory Protection Program](https://tiny.cc/usc-ehs-RPP-fs). Refer to the [CHP](http://tiny.cc/chem-hygiene-plan) (Section 8) and [EH&S Fact Sheets](https://tiny.cc/usc-ehs-fact-sheets) for additional information about PPE requirements.  [Add details of any lab- or procedure-specific PPE rules/requirements.] |
| **Exposure Control** | Secondary containment (e.g., polypropylene trays) should be used for experiments wherever there is potential for spillage of carcinogens.  To prevent exposure of personnel, appropriate engineering safety controls (normally a fume hood) shall be used for all work which has potential to release carcinogenic vapor or particulates (dust, powder, spray, or liquid/solid aerosol). Consult the CHP for detailed information on engineering safety controls.  **Carcinogens which are volatile or powdery shall NOT be weighed in the open lab.** Use a balance in a fume hood if possible. Volatile or powdery acute toxicants may only be weighed outside of a fume hood if placed inside a tared glass vial sealed with a tight-fitting cap and free of external contamination. |
| **Decontamination** | Clean and decontaminate all work areas and equipment after use.  Potentially contaminated PPE shall be removed before entering clean areas. Hands shall be washed before entering clean areas and after completion of work.  [Add details of specific decontamination/cleaning procedures, if needed.] |
| **Work Practices** | Highly potent carcinogens in non-negligible quantities or concentrations should not be handled while working alone. Purchasing, working and storage quantities of carcinogens should be kept as small as practicable. It is recommended to purchase the lowest concentration of carcinogens needed for the research. Any unused materials should be stored safely, or immediately and appropriately disposed as hazardous chemical waste.  Carcinogenic materials are considered *Particularly Hazardous Substances* (PHS) by Cal-OSHA ([8 CCR §5191 (e) (H)](https://www.dir.ca.gov/title8/5191.html)). PHS must be handled with special care, please refer to CHP Section 8 for guidance.  [Add details of specific work practices you will be using in the lab under this SOP. Work practices are rules which personnel are required to follow to be safe, for example, that certain procedures may not be done out-of-hours or alone. Work practices can also be a defined way of doing things, for example, diluting concentrated acids by pouring the acid slowly into water while stirring, with a prohibition on pouring water into the acid.] |
| **Experimental Procedures** | [Add details of specific experimental procedures/protocols you will be using in the lab under this SOP] |
| **Waste Disposal** | Contaminated materials shall be disposed as hazardous chemical waste. Follow all EH&S directions ([hazmat webpages](http://tiny.cc/usc-hazmat), [fact sheets](https://tiny.cc/usc-ehs-fact-sheets), [CHP](http://tiny.cc/chem-hygiene-plan)) when disposing of hazardous chemical waste. Email [hazmat@usc.edu](mailto:hazmat@usc.edu) if you have questions that are not answered by EH&S online resources.  [Add details of any lab-specific waste disposal rules.] |
| **Spill Response** | Chemical spill clean-up shall not be attempted if lab personnel do not have proper training and experience, necessary spill kit supplies, and/or appropriate personal protective equipment. **Before starting work, review the** [**Spill Response and Clean-Up**](http://tiny.cc/usc-spill-clnup) **web page and Section 10 of the** [**CHP**](http://tiny.cc/chem-hygiene-plan)**. All personnel operating under this SOP shall familiarize themselves with this information and shall re-review these references at least annually.**  Refer to the EH&S [Chemical Spill Kit Guide Sheet](https://tiny.cc/usc-ehs-chmSplkit-gs) for guidance on appropriate spill kit materials.  **Call DPS for all spills, even if they get cleaned up by lab personnel.** DPS will pass information to the EH&S and Hazmat on-call system. If needed, trained staff will be sent to the lab to clean and decontaminate the spill. If lab personnel clean the spill themselves, notification should still be made as lab safety specialists may wish to follow up with a routine safety investigation.  **Major spills outside a fume hood SHALL NOT be cleaned by lab personnel. Evacuate the area, restrict access, call DPS.** |
| **Emergency Response** | **Before starting work, review the** [**EH&S emergency webpage**](https://tiny.cc/usc-injury) **and the** [**1-2-3 poster**](https://tiny.cc/usc-123)**. Ensure that the 1-2-3 poster is posted in the lab.** **All personnel operating under this SOP shall familiarize themselves with these documents and webpage.**  **All personnel operating under this SOP shall have downloaded and read Section 10 of the** [**CHP**](http://tiny.cc/chem-hygiene-plan) (“*Emergency Response / Injury and Illness Reporting*”). This section provides information on chemical exposure response, spill response, and injury reporting.  **The 1-2-3 poster, CHP Section 10, and the EH&S emergency webpage are hereby incorporated into this SOP by reference.**  **All personnel operating under this SOP shall have the DPS emergency number programed into their phone** (UPC 213-740-4321; HSC 323-442-1000).  **Phone the DPS emergency line in an emergency!!** DPS have 24 h/day immediate communication access to primary and backup personnel on the EH&S and Hazmat on-call rota. **Do NOT call the EH&S general phone line or individual EH&S personnel in an emergency as access is not guaranteed.** |

SOP Acknowledgement

The undersigned acknowledge by their signature that they:

1. Have read, understood, have access to, and agree to abide by this SOP, AND;
2. Have read and understood the emergency response resources incorporated into this SOP by reference (“[**1-2-3 poster**](https://tiny.cc/usc-123)”, [**CHP Chapters 6 and 10**](http://tiny.cc/chem-hygiene-plan), and [**EH&S emergency webpage**](https://tiny.cc/usc-injury)), AND;
3. Will download, store, read, and thoroughly familiarize themselves with safety data sheets (SDSs) for all the hazardous materials they intend to use within the scope of this SOP.

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| **Name** | **USC ID** | **Email** | **Signature** | **Date** |
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Internal Training Record

If hazards are high or complex, or personnel have limited prior experience or training, then hands-on training should be provided on the contents of this SOP. For convenience, the training may be documented using this form, although PIs are free to keep internal training records in other formats if desired. Training may be conducted by the PI, or the PI may delegate a suitably experienced and knowledgeable lab member (e.g. lab manager or senior postdoc) as the trainer. If delegated, the PI still retains management responsibility for the quality and adequacy of the safety training.

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| --- | --- | --- | --- |
| Trainer name |  | Trainer position |  |
| Trainer USC ID |  | Trainer email |  |
| Trainee #1 name |  | Trainee #1 USC ID |  |
| Trainee #1 email |  | Trainee #1 signature |  |
| Trainee #2 name |  | Trainee #2 USC ID |  |
| Trainee #2 email |  | Trainee #2 signature |  |
| Trainee #3 name |  | Trainee #3 USC ID |  |
| Trainee #3 email |  | Trainee #3 signature |  |
| Trainee #4 name\* |  | Trainee #4 signature |  |
| Trainee #4 email |  | Trainee #4 USC ID |  |
| Date training started |  | Date training completed |  |
| Type of training (delete as appropriate) | **Initial training**  **Refresher training** | Type of training (delete as appropriate) | **Classroom training**  **Hands-on laboratory training** |
| If refresher training, provide date of initial training |  | If refresher training, was the initial training hands-on in the lab? | **YES 🞏 NO 🞏** |
| Signature of trainer confirming the above named trainees have successfully completed safety training on the contents of this SOP (and any additional subjects listed below) | |  | |
| Date of signing by trainer | |  | |
| Additional subjects covered by safety training |  | | |
| \* If there are more than four trainees, please append an additional sign-in sheet. | | | |

1. Section 6 for identification and Section 8 for safe working practices. [↑](#footnote-ref-1)