



Chemical Carcinogen Safety Manual



October 2008

TABLE OF CONTENTS

I. INTRODUCTION.....	4
II. RESPONSIBILITIES	4
III. CARCINOGEN CLASSIFICATION SYSTEM	6
A. Class III Carcinogens	6
B. Class II Carcinogens	6
C. Class I Carcinogens	6
IV. PROCEDURES FOR USE OF CHEMICAL CARCINOGENS.....	6
A. Labels and Signs	6
B. No Eating and Drinking in Areas Where Hazardous Chemicals are Used or Stored.....	7
C. Containment Systems and Engineering Controls	7
D. Protective Clothing and Equipment.....	6
E. Information and Training	8
F. Spills and Emergencies	9
G. Purchasing, Custody, Inventory and Shipping	10
H. Waste Management	10
I. Annual Review and Self-Audits	11
J. Carcinogen Use in Animals.....	12
K. Formaldehyde Use In Anatomy, Pathology and Histology Laboratories	12
V. REGISTRATION FOR AUTHORIZATION TO USE CHEMICAL CARCINOGENS	13
A. Registration	13
B. Changes, Additions and Deletions	13
C. Additional Considerations for Carcinogen Use In Teaching or In Departmental Storerooms.....	13
VI. GENERAL REFERENCES	13
VII. APPENDICES.....	15
A. UC Davis Campus-Recognized Chemical Carcinogens.....	15

B. Definitions.....	16
C. Summary of Chemical Carcinogen Safety Program.....	18
D. Warning Signs and Labels	19

I. Introduction

This manual covers the use of UC Davis campus-recognized chemical carcinogens other than radioactive materials. Chemical carcinogens are substances that are suspected of causing cancer in man and/or animals. The program covers both those chemical carcinogens recognized by Cal-OSHA (Title 8, California Code of Regulations) and those designated by the Chemical and Laboratory Safety Administrative Advisory Committee for special control requirements. The complete list of campus recognized chemicals can be found in Appendix A.

The objectives of the Chemical Carcinogen Program are to:

- Ensure that chemical carcinogen use on campus is as safe as possible and complies with federal and state laws, regulations and prudent laboratory practices
- Minimize exposure to carcinogens to levels as low as reasonably achievable
- Provide guidance for users of chemical carcinogens
- Document carcinogen use, location and users and prepare semi-annual reports required by Cal-OSHA

II. Responsibilities

- A. The Chemical and Laboratory Safety Administrative Advisory Committee advises the Vice Chancellor --Administration on campus policies and procedures for the safe use of chemical carcinogens on campus.
- B. The Department Chair is responsible for ensuring that the department has an effective Injury and Illness Prevention Program, Chemical Laboratory Safety Program, and that chemical carcinogens are used safely. Departments in existing campus buildings must identify suitable areas for employees to eat and store food outside of research and teaching laboratories where chemicals are used or stored. New laboratory buildings require employee eating areas to be incorporated in the building design.
- C. The Principal Investigator must ensure that the laboratory has a current Chemical Hygiene Plan and that chemical carcinogen use is in accordance with the Chemical Carcinogen Safety Program. (A summary of the specific requirements for the Chemical Carcinogen Program is in Appendix C.) The Principal Investigator is also responsible for obtaining a Chemical Carcinogen Use Authorization through the on-line Chemical Inventory System (CIS), maintaining current data and conducting an annual self-inspection.
- D. Faculty, students, staff and visitors must comply with all laboratory safety rules, regulations and procedures and attend required training.
- E. Occupational Health Services is responsible for performing required medical monitoring, evaluating employee exposures to chemical carcinogens and maintaining exposure reports.
- F. The Office of Environmental Health and Safety (EH&S) is responsible for assisting the Chemical and Laboratory Safety Administrative Advisory Committee and users of chemical carcinogens. EH&S is also responsible for maintaining general records of work areas where recognized carcinogens are used, conducting periodic air sampling to monitor exposure to chemical carcinogens and preparing required Cal-OSHA reports.

III. Carcinogen Classification System

UC Davis Campus-Recognized Chemical Carcinogens are partially classified based on information from IARC, US EPA, the potency as published by Gold and Zeiger (CRC Press, 1997), and the unit risk when it can be calculated (Technical Support Document For Describing Available Cancer Potency Factors, OEHHA, October 1997). There are three classifications based on the level of exposure control required. This list of UC Davis Chemical Carcinogens includes:

- Carcinogens recognized under Cal-OSHA Title 8 CCR Section 5200 et seq.;
- Chemicals recognized by the National Toxicology Program (NTP) as human carcinogens;
- Chemicals recognized by the International Agency for Research on Cancer (IARC) as human carcinogens;
- Other chemicals used on campus which have a body of evidence indicating they might have carcinogenic potential (producing tumors in animals and/or being genotoxic) must be presented to the Chemical and Laboratory Safety Administrative Advisory Committee for possible inclusion on the list of campus recognized chemical carcinogens.

The list of UC Davis Campus-Recognized Chemical Carcinogens does not include chemicals that act only as promoters of cancer.

A. ***Class III Carcinogens***

Class III carcinogens are those that present the greatest potential hazard. The requirements for use of Class III carcinogens are the most restrictive. Typically Class III carcinogen use is restricted to glove boxes. When sufficiently dilute a Class III carcinogen may qualify for a Class II Authorization.

B. ***Class II Carcinogens***

Class II carcinogens are those that have a moderate potential hazard and require some engineering controls for use. A chemical fume hood or ventilated enclosure is typically required to contain operations that have the potential to produce airborne gas, vapor, or particulates.

C. ***Class I Carcinogens***

Class I carcinogens are those with the lowest potential hazard. There are no requirements for special engineering controls or containment beyond that of standard chemical laboratory good work practices.

IV. Procedures for Use of Chemical Carcinogens

The procedures outlined in this section apply to all laboratory use of Class III and II carcinogens with the exception of formaldehyde used in anatomy, histology and pathology laboratories. Formaldehyde use in these situations is given special consideration outlined in Section IV.K of this manual. A written Safety Protocol that includes laboratory-specific procedures must be prepared. This Safety Protocol must address all of the elements included in this section.

A. ***Labels and Signs***

All entrances to designated carcinogen work areas should be posted with a sign stating "CAUTION: Cancer Suspect Agent" (Appendix D). These yellow signs are available from EH&S.

All primary and secondary containers, storage cabinets and glove boxes containing chemical carcinogens should be labeled with the following information:

- The name of the carcinogen and any other hazardous substance
- Caution: Cancer Suspect Agent
- Other hazard warnings such as corrosive, flammable etc.

Containers must also have one of the following on the label:

- Name and address of the manufacturer of pure materials
- The date and initials of the person who prepared mixtures

B. No Eating and Drinking in Areas Where Hazardous Chemicals are Used or Stored

The Committee of Safety Chairpersons, with the goal of providing a safe work environment and for the purposes of consistency, has established the following standardized policy statement regarding eating and drinking in areas where hazardous chemicals are used or stored as stated in P&P 290-65:

Storage, consumption, and use of food, beverage, medicines, tobacco, chewing gum, and the application of cosmetics or handling of contact lenses are prohibited in areas where hazardous chemicals are used or stored.

C. Containment Systems and Engineering Controls

1. Glove boxes

A glove box is a fully enclosed and ventilated containment device fitted with arm holes for attachable flexible gloves which allows work with materials within a contained enclosure. Glove boxes are required to be totally exhausted to the outside. Glove boxes used with Class III carcinogens are to be tested semi-annually by Facilities. Gloveboxes used with other carcinogens are to be tested annually by Facilities. In addition, testing should be done after modification of the box and after maintenance. Glove boxes should be used for storing and diluting stock solutions of Class III carcinogens. Users should replace gloves when worn or damaged.

2. Chemical Fume Hoods

Chemical fume hoods should be tested annually or after modification or maintenance and have an average face velocity of 100-150 feet per minute. Testing is done by Facilities Services. Ductless hoods are not approved for use with chemical carcinogens.

3. Local Exhaust

Potentially airborne carcinogens such as is produced by analytical instruments should be captured through the use of a local exhaust ventilation system connected to the building fume hood mechanical exhaust system.

4. Biosafety Hoods and Cabinets

Biosafety hoods or cabinets should not be used for chemical carcinogen work without prior approval from EH&S.

5. Clean Benches

Clean Benches are work areas using laminar flow hoods that provide product protection not worker protection and should not be used for chemical carcinogen work.

6. Exhaust from Ventilation Control Systems

Class III carcinogen use requires that laboratory exhaust ventilation, glove boxes, laboratory fume hoods and biosafety hoods and cabinets be equipped with approved exhaust treatment systems. The exhaust treatment depends on the nature of the compound and will need to be determined during the registration review. Examples of treatment are HEPA filters (particulates only), activated charcoal filters, exhaust incinerators and chemical scrubbers. The exhaust discharge must be located to prevent re-entrainment into the building.

7. Laboratory Ventilation

The laboratory ventilation system should be checked by EH&S before use of chemical carcinogens. The system must meet the following requirements:

- Six air changes per hour minimum;
- Laboratory should be under negative pressure relative to hallways and non-laboratory areas;
- Ducted chemical fume hood or use of approved, filtered glove box.

8. Vacuum Lines

Building vacuum systems should not be used for chemical carcinogen work. Dedicated vacuum pumps and/or building system with special traps for chemical carcinogens should be used.

D. Protective Clothing and Equipment

The Committee of Safety Chairpersons, with the goal of providing a safe work environment and for the purposes of consistency, has established the following standardized policy statement for the use of protective clothing and equipment:

Minimum laboratory protective clothing and equipment for handling hazardous materials or animals include, but are not limited to, a laboratory coat, closed-toe/heel shoes, goggles and/or face shield if there is a risk of a splash hazard, and gloves if there is a risk of skin irritation, absorption or injury. Additional safety equipment and clothing requirements e.g. respiratory protection and/or disposal garments, may be required as part of a "Use Authorization or Registration" protocol (radiological, biological, carcinogen, or animal care and use).

Appropriate and necessary protective clothing and personal protective equipment (PPE) will be determined by performing a job hazard analysis risk assessment as part of the Illness and Injury Prevention Plan (IIPP) protocol. The risk assessment is to be administered by the supervisor and employee(s). Medical surveillance requirements will be determined in consultation with Occupational Health.

Protective clothing should be worn when working with carcinogens; this includes animal care personnel. Protective clothing should include fully fastened laboratory or shop coat or

coveralls and closed toed shoes. Disposable coveralls with hoods and/or shoe covers may be required for specific operations. Clothing should be cleaned commercially if not disposable.

Clothing contaminated by chemical carcinogens should be removed immediately. Place contaminated clothing in double plastic bags, labeled with the name of the carcinogen and send to an approved industrial laundry. When clothing decontamination methods are not known or are not practical, disposable protective clothing should be worn.

Gloves should be selected based on the properties of the chemicals being used (i.e., type of carcinogen, solvent or mixture) and the type of operation being performed. Multiple layers may be necessary to prevent permeation when working with a mixture. Disposable gloves should be discarded after each use and immediately after contamination with a chemical carcinogen. Gloves must be removed before touching doorknobs, telephones, elevator controls or in other situations where contamination could be transferred to non-laboratory areas.

Eye protection should be worn in the laboratory any time chemical carcinogen work and other chemical work is performed when splashing could occur. The type of protection used depends on the hazard presented by the operation and the chemical in use. Chemical splash goggles are appropriate for most laboratory procedures. Glasses do not provide adequate protection. Face shields may be required for some operations. EH&S can provide recommendations on appropriate eye protection. If you need medical advice about wearing contact lens in areas where chemical carcinogens are used or stored, contact Occupational Health Services at (530) 757-3200. If you would like general safety information about contact lenses refer to Safety Net #5, Eye and Face Safety Protection for Laboratory Workers (<http://safetyservices.ucdavis.edu/environmental-health-safety/safetynets/master-list-1/5>).

Respiratory protection may be required if exposure monitoring indicates that exposure levels mandated by Cal-OSHA are exceeded. Contact EH&S for evaluation and further information about the proper use of respirators. Respirator use should be a temporary measure until containment systems and engineering controls are provided.

PIs and/or supervisors are responsible for performing a job hazard analysis as required by the IIPP. Requirements for personal protective clothing, equipment and procedures will be incorporated in each laboratory procedure (SOP).

E. Information and Training

Hazard information and safety procedures should be reviewed and updated annually with laboratory and animal care personnel who work with or who may be exposed to chemical carcinogens. Training records should be documented with the name and signature of each attendee, name of the trainer, content of the class and the date.

1. Training Information

Training should include the following:

- A description of the use that could result in exposure including written experimental procedures;
- The nature of the physical and health hazards (i.e. fire, explosion, carcinogenic, toxicity) associated with exposure. Training should include both local and systemic toxicity, and should include review of the Material Safety Data Sheet for the carcinogen;
- Engineering controls, administrative controls, personal protective equipment and laboratory or general work practices to limit exposure;

- Employee responsibilities for following prudent laboratory practices to reduce risk of exposure;
- A review of the written Safety Protocol ;
- Monitoring methods and observations that may be used to detect or evaluate the presence or release of a carcinogen;
- Proper storage, labeling and disposal practices;
- Job responsibilities;
- Waste disposal procedures.

2. Training Frequency

Training is required prior to the employee's initial work with the carcinogen. Refresher training should be completed and documented at least annually.

3. Custodians, Maintenance Personnel, and Laboratory Visitors

Custodians and maintenance personnel should be advised of any risk of contamination that is not clearly marked with warning signs or labels. Laboratory visitors should be escorted at all times or provided with training on laboratory hazards.

F. Spills and Emergencies

Before beginning an activity that involves a chemical carcinogen, plans for emergency response to spills, exposures or accidents should be developed and incorporated in the Safety Protocol. Emergency planning should include procedures for:

- Evacuating the area and contacting the Fire Department (911);
- Restricting access to the area;
- Showering or washing;
- Obtaining emergency medical treatment;
- Eliminating hazards that may still exist;
- Decontaminating the area.

1. Medical consultation

If inhalation, contact, needle stick or ingestion occurs during working hours (8 AM-5 PM) report to Occupational Health Services or Cowell Student Health Center for evaluation. Call 911 for emergency assistance after hours.

2. Emergency Phone Numbers

Hazardous Materials Spill, Fire, Police, Ambulance 911

Davis (area code 530)

Occupational Health Services (Russell Blvd. and Oak St.)	757-3200
Cowell Student Health	752-2300
Sutter Davis Hospital Emergency Room (nights and weekends)	757-5111

Environmental Health and Safety (8am-noon, 1pm-5pm weekdays) 752-1493

Sacramento (area code 916)

Employee Health Services (7 a.m. – 4 p.m., M-F) 734-3572

After Hours Urgent Care Clinic

MedClinic, 3160 Folsom Blvd. 733-3377

(4 p.m. -10 p.m. M-F) (10 a.m. – 6 p.m. Weekends)

UC Davis Medical Center Emergency Room 734-3624

(10 p.m. – 7 a.m. M-F) (6 p.m. – 10 a.m. Weekends)

EH&S Research Specialist - EH&S Sacramento 734-7321

EH&S Occupational Safety - EH&S Sacramento 734-2740

(8 a.m. – 12 p.m., 1 p.m. – 5 p.m. Weekdays)

G. *Purchasing, Custody, Inventory, and Shipping*

Only the amount of chemical carcinogen that is needed for a particular project should be ordered.

The Principal Investigator or Course Instructor is responsible for the custody of recognized chemical carcinogens.

A current inventory of carcinogens must be maintained at all times. Laboratories are to use the Chemical Inventory System (CIS) to report any quantity of any carcinogen materials listed in Table 1. The Chemical Inventory System (CIS) is available at <http://safetyapps.ucdavis.edu/EHS/cis/index.cfm>. The CIS database will indicate UC Davis recognized Chemical Carcinogens. Requests for transfer of materials should be directed to EH&S. Addition or deletion of carcinogens to a CUA must be promptly updated in the CIS.

For guidance on packing and shipping chemical carcinogens off campus, contact Mail Services (530) 752-8223 (Davis) or (916) 734-3851 (Sacramento). Carcinogens must be packed to withstand shock, pressure changes, and any other conditions that may cause leakage of contents. The packaging must be designed to hold leaks if the primary container breaks. Off-campus shipments must comply with US Department of Transportation regulations, and international regulations if going out of the United States.

H. *Waste Management*

Before beginning an activity that involves the use of a chemical carcinogen, plans should be developed for the handling and disposal of contaminated wastes and surplus carcinogens. Whenever practical, carcinogens should be inactivated prior to disposal as hazardous waste. It is the responsibility of the Principal Investigator to document the validity of the inactivation method. Waste containing or contaminated with any amount of chemical carcinogen is considered hazardous unless and until evaluated and determined to be non-hazardous by the EH&S Waste Coordinator. Reducing the amount of waste produced will assist with meeting the campus Source Reduction and Waste Minimization Plan goals.

Before requesting a waste pick-up:

- Segregate carcinogen waste from other waste;
- Contaminated materials that are to be transferred from work areas to disposal areas should first be placed in a plastic bag, or other suitable impermeable container, and then in a primary container. Label the outer container with (a) the name of the carcinogen and (b) "CAUTION: Cancer Suspect Agent";

- Waste must be labeled with a standard Hazardous Waste label. The forms are available from the EH&S website at <http://safetyervices.ucdavis.edu/environmental-health-safety/chemical/forms/Wastelbl.doc>
- Waste containing more than 0.1% of a Class III carcinogen must be labeled: "CAUTION: CANCER SUSPECT AGENT". Labels are available from EH&S;
- Submit chemical waste pick-up requests via the EH&S web site at: <http://safetyapps.ucdavis.edu/EHS/wasterequest/chems.cfm> Web site pick-up requests are also available for radiological, biological and mixed wastes at: <http://safetyapps.ucdavis.edu/EHS/wasterequest/index.cfm> Alternatively, a form can be downloaded from EH&S at: <http://safetyervices.ucdavis.edu/environmental-health-safety/chemical/forms/chemdisp.doc> or obtained by calling EH&S at (530) 752-1493. Submit the completed chemical waste pick-up request form to EH&S by fax (752-2785) or via campus mail using the disposal request form. A separate form is used for sharps disposal;
- Animal bedding may be disposed as hazardous waste. Animal bedding waste that does not qualify as hazardous waste may be disposed as biological waste with other bedding materials;
- Spill waste must be collected, labeled and disposed as hazardous waste;
- Mixed chemical and radiological or biological waste requires special consideration. Contact EH&S for guidance.

I. Annual Review and Self-Audits

Principal Investigators with Class II and III Chemical Carcinogens must conduct an annual review and self-audits. An e-mail will be sent to the Principal Investigator and lab contact to notify them that an annual chemical inventory review and self-audits are due.

Audits must verify:

- All Class III carcinogens are shipped, stored, and used in a glove box, poison pack, septum vial, or other closed system.
- Fume hoods have a face velocity of 100 fpm or greater and have been tested within the past year.
- Work surfaces are protected with plastic lined absorbent paper to aid in spill clean up
- Vacuum lines are protected with a suitable in-line vacuum trap.
- Doors are labeled with a warning sign for "Cancer Suspect Agent".
- Personal protective equipment is worn when using carcinogens;
- Carcinogen containers and waste containers are labeled.
- The laboratory complies with the University's policy of no eating, drinking, smoking, application of cosmetics, chewing gum, chewing tobacco, taking oral medication, or storage of consumables.
- Personnel who work with carcinogens are trained on the chemical carcinogen procedures, MSDS(s), and safety protocols..

J. Carcinogen Use in Animals

Class III and II carcinogen use in animal experiments may present a significant risk of exposure to animal handlers. The Principal Investigator must take special precautions to ensure that animal handlers are not at risk of exposure to chemical carcinogens and other hazardous materials. For example, contamination may be present on the fur or skin of an animal, in animal body fluids or vomit. Carcinogen treated food may contaminate the floor of the animal room. An Animal Handler Precautions form is required to be completed. Rooms housing animals treated with recognized carcinogens must meet the same containment and engineering controls as required for laboratories.

Selection of Animal Handlers: Animal care staff should not be expected to care for animals treated with Class III or II carcinogens without substantial additional training. When there is a significant risk of exposure, all animal care, including feeding and cage changing, should be performed by trained laboratory employees. If the PI will be conducting the routine husbandry it needs to be clearly described in the Special Husbandry Requirements section of the animal care protocol.

The Principal Investigator must prepare and submit a "Protocol for Animal Use and Care" for each project planned using animals. When planning research involving carcinogen use with animals, the animal handler's precaution form /door sheet found in the Animal Use and Care Protocol should be submitted as part of the Carcinogen Use Application. This page is now labeled "Room/Lab Safety Information". It summarizes the potential hazards and precautions related to caring for the animals; this designates appropriate protective equipment and waste handling. Both the Safety Protocol and the Room/Lab Safety Information Sheet must be posted in the animal facility as a precaution to animal handlers. Generally these are posted on the animal room door to alert the animal handlers prior to entering the room. Cages/racks used for animals that have been treated with carcinogens must be identified with a "CAUTION: Cancer Suspect Agent" label.

Evaluation of potentially contaminated animal waste (e.g. bedding, carcasses) must be made in coordination with EH&S. Documentation of this waste determination must be in the carcinogen files.

K. Formaldehyde Use in Anatomy, Pathology and Histology Laboratories

Cal-OSHA regulations (8 CCR 5217) allow for the use of formaldehyde in anatomy, histology and pathology laboratories subject to special requirements, even if the concentration would qualify for Class I use. Special requirements are as follows:

1. Exposure monitoring

Monitoring for formaldehyde exposures must be done periodically. The exposure monitoring will be performed by EH&S and results will be provided to the employee, the supervisor and the Occupational Health Physician. To request exposure monitoring, contact your Departmental Safety Advisor or call EH&S at (530) 752-1493. Exposure monitoring records are kept by EH&S and are also placed in the employee's medical file by Employee Health Services.

2. Exposure control

Personal exposure in excess of regulatory limits (2 parts per million in air in a 15 minute period or 0.75 parts per million in air for an 8 hour period) requires immediate action to reduce the exposure. Respiratory protection may only be used as a temporary solution in areas of overexposure. Exposure must be controlled with containment systems and engineering and work practice controls. Areas in which exposures are not controlled are

subject to additional requirements such as mandatory medical monitoring of employees and restriction of access to the laboratory.

3. Training

Employees exposed to formaldehyde in anatomy, pathology and histology laboratories are required to be trained on the following:

- Potential health hazards of formaldehyde exposure, and signs and symptoms of exposure, including review of a Material Safety Data Sheet for formaldehyde;
- A description of safe work practices to limit exposure;
- Use and limitations of protective equipment;
- Procedures for spills and other emergencies;
- The use of glove boxes, chemical fume hoods, local exhaust and other controls, along with information on how to check that the equipment is functioning.,

V. **Registration/Authorization to Use Chemical Carcinogens**

A. *Registration/Authorization*

If a UC Davis-Recognized Chemical Carcinogen is entered into a CIS Account, then the user has been registered and a Chemical Carcinogen Use Authorization is automatically established with the carcinogens, building and rooms, and the Principal Investigator as a user. A page will automatically appear to registration/review/update –such that other users can be added to the Chemical Carcinogen Authorization.

Note, the Carcinogen Use Authorization (CUA) and procedural requirements listed in this manual apply to the use and/or storage of the chemical carcinogens listed in Appendix A. Suspect carcinogens from other lists (e.g. Prop 65 and OEHHA) and chemicals otherwise not on the campus list are the exempt from these carcinogen requirements. Such chemicals should be handled with good lab practices.

B. *Changes, Additions and Deletions*

The Principal Investigator is responsible for updating CIS within 15 days of any changes to chemical carcinogen possession, location or users.

C. *Additional Considerations for Carcinogen Use in Teaching or Departmental Storerooms*

The Course Instructor in charge is responsible for obtaining and managing a CUA for the teaching laboratory and/or stockroom.

The CUAs for departmental teaching laboratories or storerooms allow for flexibility in staffing changes while maintaining accurate records for individuals on the CUA. A teaching CUA application must be updated annually.

VI. **General References**

National Toxicology Program, *Annual Report on Carcinogens*, US Department of Health and Human Services, Research Triangle Park, NC (latest edition).

International Agency for Research on Cancer, *Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Man*, World Health Organization, Lyon, France (latest edition).

National Research Council, *Prudent Practices for Handling Hazardous Chemicals in Laboratories* (National Academy Press, Washington, D.C., 1995).

R. Lewis, *Carcinogenically Active Chemicals: A Reference Guide* (Van Nostrand Reinhold, N.Y., 1991).

A. Furr, *Handbook of Laboratory Safety*, 4th ed. (CRC Press, Boca Raton, FL, 1995).

U.S. Department of Health and Human Services, National Institutes of Health (1978), *Guide for the Care and Use of Laboratory Animals*, DHEW Publication No. (NIH) 78-23.

8 CCR 5209, *Carcinogens*. Cal-OSHA.

8 CCR Article 110, *Recognized Carcinogens, sections 5200 et seq.* Cal-OSHA.

8 CCR 5217, *Formaldehyde*. Cal-OSHA.

8 CCR 5191, *Occupational Exposure to Hazardous Chemicals in Laboratories*. Cal-OSHA.

EH&S, *Chemical Laboratory Safety Manual*, (UC Davis, 1996).

VII. Appendices

A. UC Davis Campus-Recognized Chemical Carcinogens⁺

<i>Chemical Name</i>	<i>Class</i>	<i>Chemical Name</i>	<i>Class</i>
*2-Acetylaminofluorene (2-AAF)	III/II ¹	*Ethylene oxide	II
*Acrylonitrile	II	*Ethyleneimine	III/II ¹
Aflatoxin	III/II ²	*Formaldehyde/Formalin	II/I ¹
*4-Aminodiphenyl	III/II ²	*Lead (elemental, inorganic compounds and lead soaps)	II
*Arsenic (Inorganic Arsenic Compounds)	II	3-Methylcholanthrene (3-MC)	III/II ²
*Asbestos	II	*4,4'-Methylene bis(2-chloroaniline) [MBOCA]	II
*Benzene	II	*Methylene Chloride	II
*Benzidine and its salt	III/II ²	*Methylenedianiline	II
Benzo [a] pyrene (BAP)	III/II ²	N-Methyl-N'-Nitro-N-nitrosoguanidine (MNNG)	II
Beryllium and Beryllium compounds	II/I ³	*1-Naphthylamine	III/II ¹
*Bis (chloromethyl) ether (BCME)	III/II ²	*2-Naphthylamine	III/II ²
*1,3-Butadiene	II	Nickel compounds	II/I ³
*Cadmium and its salts	II/I ³	*4-Nitrobiphenyl	III/II ²
*Chloromethyl methyl ether (methyl chloromethyl ether; MCME)	III/II ²	*Nitrosodimethylamine	III/II ²
Chromium (hexavalent) compounds	II/I ³	Nitrosamines (all others)	III/II ²
*Coke oven emissions and by-products	II	*beta-Propiolactone	III/II ¹
*1,2-Dibromo-3-chloropropane (DBCP)	III/II ²	Talc containing asbestiform fibers	II
*3-3'-Dichlorobenzidine and its salts	III/II ¹	Tamoxifen	II
*4-Dimethylaminoazobenzene	III/II ¹	2,3,7,8-Tetrachlorodibenzo-para-dioxin [TCDD]	III/II ²
7,12-Dimethylbenz (a) anthracene (DMBA)	III/II ²	*Vinyl chloride	II
*Ethylene dibromide (EDB, 1,2-dibromoethane)	II	Vinyl fluoride	II

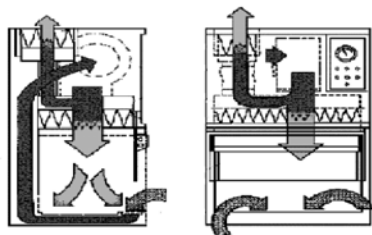
1. Qualifies for the lower classification at a concentration of 1% by weight or volume
2. Qualifies for the lower classification at a concentration of 0.1% by weight or volume
3. Qualifies for the lower classification when dealing with a salt in solution.

* Cal-OSHA recognized carcinogens NOTE: A complete listing of UC Davis-recognized chemical carcinogens including the Proposition 65 chemical carcinogens can be obtained from EH&S.

+The Chemical and Laboratory Safety Administrative Advisory Committee may make changes to this list at any time. This list is current as of the date below. To check for updates, contact EH&S at 752-1493 or see the EH&S web site at: <http://www.ehs.ucdavis.edu/chem/carcman1.html>

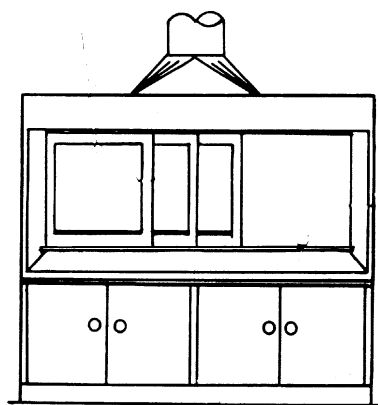
B. Definitions

Activated charcoal filter: A device containing activated charcoal to absorb and retain chemical carcinogens present in the vapor state.



Biosafety cabinet: A ventilated cabinet that serves as a primary containment device for operations involving biohazardous agents or biohazardous materials. It is designed to draw air inward for user protection and downward flow of HEPA filtered air for product protection. Air is exhausted out of the cabinet through HEPA filters for environmental protection.

Campus recognized chemical carcinogen: A chemical carcinogen listed as a UC Davis Campus-Recognized Carcinogen (Appendix A). These include carcinogens recognized by Cal-OSHA and others designated by the Chemical and Laboratory Safety Administrative Advisory Committee for special control requirements. Carcinogens are rated III, II, or I based on potential hazards.



Chemical fume hood: A local exhaust unit with rear and side walls designed to effectively control atmospheric contamination (hazardous gases, vapors and/or fumes) at its source. The chemical fume hood depends upon the creation of air flow past the source of contaminant sufficient to remove the highly contaminated air around the source or issuing from the source and to draw the air into an exhaust system vented directly to the outdoors. It should have an average linear face velocity of 100-150 feet per minute (fpm), with a minimum of 70 fpm at any point.

Class III Carcinogen: This is our highest carcinogen hazard class. The Class III carcinogen designation is used to describe chemical carcinogens recognized by Cal-OSHA in Title 8 CCR 5209, when used in above exempt concentrations and selected chemical carcinogens that in the opinion of the Chemical Safety and Laboratory Safety Advisory Committee require special precautions.

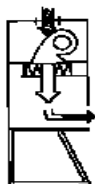
Class III Carcinogen Use Authorization: Class III Carcinogen Use Authorization (CUA) is the most restrictive category and is given for use that could result in the greatest hazard potential. Class III carcinogens are restricted to use in a glove box or in a Cal-OSHA recognized area. A Class III carcinogen may qualify for a Class II status after dilution.

Class II Carcinogen: These are considered as moderately hazardous carcinogens. The Class II carcinogen designation is used to describe chemical carcinogens recognized in Title 8 CCR 5209, used at or below exempt concentrations and those chemicals when used in research and teaching activities that in the opinion of the Chemical and Laboratory Safety Advisory Committee require special precautions.

Class II Carcinogen Use Authorization: The Class II Carcinogen Use Authorization is given for work with chemical carcinogens that have moderate hazard potential and must be used in an approved chemical laboratory. Typically a chemical fume hood or ventilated enclosure is required for containing Class II chemical carcinogen operations that have the potential to produce airborne gas, vapor, or particulates.

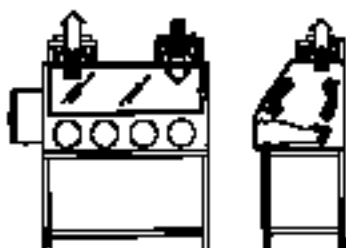
Class I Carcinogen: These are considered the lowest hazard carcinogens. The Class I chemical carcinogens are those chemical carcinogens used in research and teaching activities that in the opinion of the Chemical and Laboratory Safety Administrative Advisory Committee require no special precautions other than prudent laboratory safety practices regardless of concentration.

Class I Carcinogen Use Authorization: The Class C carcinogen use authorization is given for work with chemical carcinogens that have the lowest hazard potential. The only requirements are that work must be done in a standard chemical laboratory using prudent laboratory practices. Class I Chemical Carcinogen registration is through the CIS.



Clean bench: A laminar flow hood that provides only product protection, not worker protection. HEPA filtered air flows across the work area towards the user. A clean bench must not be used for chemical carcinogen or other hazardous materials work.

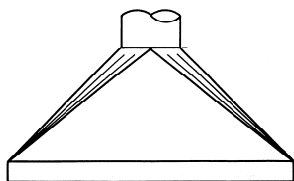
Emergency: An incident involving a chemical carcinogen that may result in exposure or release to the environment.



Glove box: A fully enclosed and ventilated containment device fitted with arm holes for attachable flexible gloves. Hands are inserted into the gloves to allow work with materials contained inside the box without contact with or exposure to the material. The glove box is under negative pressure relative to the room where it is located so that any air leakage is into the glove box.

HEPA filter: High Efficiency Particulate Air filter capable of removing 99.97% of particles down to 0.3 μm diameter.

Inactivation: Chemical alteration of a carcinogen to render it non-carcinogenic.



Local exhaust system: A ventilation system designed to remove hazardous or other air contaminants at their point of origin using ducts, funnels, and cones. The system may partially enclose the source of generation. The system is exhausted to the building exterior.

Mixed waste: Waste containing both hazardous waste and radioactive substances. This waste requires special handling, transporting, treating, and disposal methods.

Personal protective clothing: Clothing which are designed to protect a worker against contact with or exposure to a chemical carcinogen such as gloves and a laboratory coat.

Personal protective equipment: Equipment used in addition to protective clothing, such as a face shield or respirator, that is designed to protect a worker against contact with or exposure to a chemical carcinogen.

Working quantity: The amount of a chemical carcinogen required to carry out a project on a day-to-day basis.

C. Summary of Chemical Carcinogen Safety Program

Summary of Specific Requirements

<i>Requirement</i> R=Required, A=Advised, (R)=may be required in some cases	<i>CLASS</i>		
	III	II	I
Registration by Entering in CIS	R	R	
Entering All Carcinogens Users	R	R	
Approved by Campus Veterinarian (Animal Use)	R	R	R
Written Experimental Protocol	R	R	
Written, Posted Safety Protocol	R	R	
Laboratory Criteria			
<ul style="list-style-type: none"> • Glove box or isolated system with treated exhaust system approved by EH&S <u>Or</u> <ul style="list-style-type: none"> • Conventional laboratory with protected vacuum lines, independent and filtered ventilation system (approved by EH&S), controlled access (system approved by Chemical and Laboratory Safety Administrative Advisory Committee), plus other requirements (see Chemical Carcinogen Safety Manual) 	R		
• Conventional Laboratory with some restrictions		R	
• Conventional Laboratory not otherwise recognized			R
• Audit: every six months	R		
• Audit: annually		R	
• Fume Hood Face Velocity: 100-150 lfm average	R	R	R
• Work surfaces protected with absorbent paper and/or containment	R	R	A
• Protected vacuum lines (if used)	R	R	R
Storage and Labeling			
• Storage containers labeled as "Cancer Suspect Agent"	R	R	
• Waste containers labeled as "Cancer Suspect Agent"	R	R	
• Entrances to laboratory posted with "Cancer Suspect Agent" signs	R	R	
• Current inventory maintained	R	R	R
Housekeeping			
• Dry sweeping of dry chemicals is prohibited	R	R	R
Decontamination and Disposal			
• Contaminated materials disposed of by EH&S	R	R	R
Personal Protection			
• No eating, drinking, smoking, application of cosmetics, chewing gum, chewing tobacco, taking oral medication, or storage of consumable items	R	R	R
• No pipetting by mouth	R	R	R
• Laboratory coat or other full body garment, safety glasses, gloves required	R	R	R
Training of personnel (annual retraining)	R	R	R
Training of Animal Caretakers	R	R	R
Medical Surveillance			
• Prior to project approval and after emergency	(R)	(R)	(R)

"III" = Carcinogens requiring registration in CIS.

"II" = Carcinogens requiring registration in CIS

"I" = Low hazard carcinogens including all Proposition 65 carcinogens. Must be included as part of the UC Davis Injury and Illness Prevention/Laboratory Safety Program and CIS.

D. Warning Signs and Labels

The bright yellow sign shown below is available from the Office of Environmental Health & Safety at (530) 752-1493.

