

**SAN DIEGO STATE UNIVERSITY
ENVIRONMENTAL HEALTH & SAFETY DEPARTMENT**

**STANDARD OPERATING PROCEDURES
ANTINEOPLASTIC DRUGS**

Standard operating procedures (SOP) are intended to provide you with general guidance on how to safely work with a specific class of chemical or hazard. This SOP is generic in nature. It addresses the use and handling of substances by hazard class only. In some instances multiple SOPs may be applicable for a specific chemical (i.e., both the SOPs for flammable liquids and carcinogens would apply to benzene). If you have questions concerning the applicability of any items listed in this procedure contact Environmental Health & Safety Department (619) 594-6778 or the Principal Investigator of your laboratory. Specific written procedures are the responsibility of the principal investigator.

If compliance with all the requirements of this standard operating procedure is not possible, the principal investigator must develop a written procedure that will be used in its place. This alternate procedure must provide the same level of protection as the SOP it replaces.

Antineoplastic drugs are substances used as a cancer chemotherapeutic agent which affect the reproductive capabilities including chromosomal damage (mutagens), effects on the fetus (teratogens), and are carcinogenic in animal models.

Hazard assessment

Hazard assessment should focus on proper handling techniques, education of laboratory workers concerning the health risks posed by antineoplastic drugs regarding reproductive hazards, and potential carcinogenic effects.

EH&S Notification

You should notify Environmental Health & Safety Department prior to the initial use of antineoplastic drugs. Notification is also required following significant changes in procedures or the quantity of materials used.

Special storage

Antineoplastic drugs must be stored in a designated area.

Designated area

The room sign for the laboratory must contain a *Designated Areas Within* identifier.

All locations within the laboratory where reproductive hazards are handled should be demarcated with designated area caution tape and/or posted with designated area caution signs. This includes all fume hoods and bench tops where the antineoplastic drugs are handled.

Where feasible, antineoplastic drugs should be manipulated over plastic-backed disposable paper work surfaces. These disposable work surfaces minimize work area contamination and simplify clean up.

Securing of gas cylinders

Not applicable

Eye protection

Eye protection in the form of safety glasses must be worn at all times when handling antineoplastic drugs. Ordinary (street) prescription glasses do not provide adequate protection. (Contrary to popular opinion these glasses cannot pass the rigorous test for industrial safety glasses.) Adequate safety glasses must meet the requirements of the American Standard Practice for Occupational and Educational Eye and Face Protection (ANSI Z.87. 1 1989) and must be equipped with side shields. Safety glasses with side shields do not provide adequate protection from splashes; therefore, when the potential for a splash hazard exists, other eye protection and/or face protection must be worn such as goggles or a face shield.

Eyewash

Where the eyes or body of any person may be exposed to antineoplastic drugs, suitable facilities for quick drenching or flushing of the eyes and body shall be provided within the work area for immediate emergency use.

Respiratory protection

Fume hood

Manipulation of antineoplastic drugs should be carried out in a fume hood. If the use of a fume hood proves impractical refer to the section on special ventilation.

All areas where antineoplastic drugs are stored or manipulated must be labeled as a designated area.

Special ventilation

Manipulation of antineoplastic drugs outside of a fume hood may require special ventilation controls in order to minimize exposure to the material. Fume hoods provide the best protection against exposure to reproductive hazards and carcinogens in the laboratory and are the preferred ventilation control device. When possible, handle antineoplastic drugs in a fume hood. If the use of a fume hood proves impractical attempt to work in a glove box or on an isolated area of the bench top.

If available, consider using a Biological Safety Cabinet. The biological safety cabinet is designed to remove particulates (the reproductive hazard) before the air is discharged into the environment. Antineoplastic drugs that are volatile must not be used in a biological safety cabinet unless the cabinet is vented to the outdoors.

If available, consider using a Vertical Laminar Air Flow (VLAF) hood. The VLAF hood is designed to remove particulates via a HEPA filter (the reproductive hazard) before the air is discharged into the environment. Antineoplastic drugs that are volatile must not be used in a VLAF hood unless the hood is vented to the outdoors.

If your research does not permit the handling of antineoplastic drugs in a fume hood, biological safety cabinet, or VLAF hood, you must contact the Environmental Health & Safety Department (619) 594-6778.

All areas where antineoplastic drugs are stored or manipulated must be labeled as a designated area.

Protective apparel

Lab coats, closed toed shoes and long sleeved clothing should be worn when handling antineoplastic drugs. Additional protective clothing should be worn if the possibility of skin contact is likely.

Safety shielding

Safety shielding is required any time there is a risk of explosion, splash hazard or a highly exothermic reaction. All manipulations of antineoplastic drugs which pose this risk should be

performed in a fume hood with the sash in the lowest feasible position. Portable shields, which provide protection to all laboratory occupants, are acceptable.

Gloves

Gloves should be worn when handling antineoplastic drugs. Disposable nitrile gloves provide adequate protection against accidental hand contact with small quantities of most laboratory chemicals. Lab workers should contact EH&S for advice on chemical resistant glove selection when direct or prolonged contact with hazardous chemicals is anticipated.

Safety shower

A safety or drench shower should be available in a nearby location where the antineoplastic drugs are used.

Signs and labels

Doorways: The room sign must contain a Designated Area Within Caution where carcinogens, reproductive hazards, and/or acutely toxic chemicals are stored or used.

Containers: All containers of antineoplastic drugs must be clearly labeled with the correct chemical name. Handwritten labels are acceptable; chemical formulas and structural formulas are not acceptable.

Vacuum protection

Evacuated glassware can implode and eject flying glass, and splattered chemicals. Vacuum work involving antineoplastic drugs must be conducted in a fume hood, glove box or isolated in an acceptable manner.

Mechanical vacuum pumps must be protected using cold traps and, where appropriate, filtered to prevent particulate release. The exhaust for the pumps must be vented into an exhaust hood.

Waste disposal

All materials contaminated with antineoplastic drugs should be disposed of as a hazardous waste. The contaminated antineoplastic drug waste should be stored separately from bulk waste. Wherever possible, attempt to design research in a manner that reduces the quantity of waste generated. Questions regarding waste pick up should be directed Environmental Health & Safety Department. This office can also assist you in minimizing waste generation.

Decontamination procedures

Personnel: Wash hands and arms with soap and water immediately after handling antineoplastic drugs.

Area: Decontamination procedures vary depending on the material being handled. The toxicity of some materials can be neutralized with other reagents. All surfaces should be wiped with the appropriate cleaning agent following dispensing or handling. Waste materials generated should be treated as hazardous waste.

Equipment: Decontaminate vacuum pumps or other contaminated equipment (glassware) before removing them from the designated area.

Spill response

Anticipate spills by having the appropriate clean up equipment on hand. The appropriate clean up supplies can be determined by consulting the material safety data sheet. This should occur prior to the use of any reproductive hazard.

In the event of a spill, alert personnel in the area that a spill has occurred. Do not attempt to handle a spill of antineoplastic drugs. Vacate the laboratory immediately and call for assistance.

- Environmental Health & Safety Department (619) 594-6778
- San Diego State University Public Safety Department Emergency Number (619) 594-1991 or 911 from a campus phone.

Remain on the scene, but at a safe distance, to receive and direct safety personnel when they arrive.

Emergency procedure

Emergency procedures which address response actions to fires, explosions, spills, injury to staff, or the development of sign and symptom of overexposure must be developed. The procedures should address as a minimum the following:

Who to contact: (University police, Environmental Health & Safety Department (619) 594-6778, Principal investigator of the laboratory including evening phone number)

The location of all safety equipment (showers, eye wash, fire extinguishers, etc.)

The method used to alert personnel in nearby areas of potential hazards

The location and quantity of all antineoplastic drugs stored in the laboratory

Special first aid treatment required by the type of antineoplastic drugs handled in the laboratory

Alkylating Agents

Bulsufan (Myleran)
Carboplatin (Paraplatin)
Chlorambucil
Cisplatin
Cyclophosphamide (Cytoxan)
Dacarbazine (DTIC-Dom3)
Dianhydrogalactitol
Dibromodulcitol Phosphate
Estramustine Phosphate
Ifosfamide
Mechlorethamine (Nitrogen Mustard)
Melphalan (Phenylalanine Mustard)
Thiotepa
Uracil Mustard

Antibiotics

Aclarubicin
Bleomycin
Dactinomycin (Actinomycin D)
Daunorubicin
Doxorubicin (Adriamycin)
Epirubicin
Esoxubicin
Idarubicin
Menogaril
Mitomycin C
Plicamycin (Mithramycin)

Nitrosoureas

Carmustine (BCNU)
Chlorozotoin (DCNU)
Lomustine (CCNU)
Semustine (methyl-CCNU)
Streptozocin

Antimetabolites

5-Azacytidine
Bisantrene
Cytarabine (Cytosine Arabinoside)
Dichloromethotrexate
Floxuridine (FUDR, 5-Fluorodeoxyuridine)
5-Fluorouracil (5FU)
Hydroxyurea
6-Mercaptopurine (6MP)
Methotrexate (Amethopterin)
6-Thioguanine
Pentostatin
Pibibroman
Tegafur
Triazinate
Trimetrexate Glucuronate

Hormones

Buserelin
Conjugate Equine Estrogen (Premarin)
Cortisone
Chlorotriane (Tace)
Dexamethasone (Decadron)
Diethylstilbestrol (DES)
Ethinyl Estradiol (Estinyl)
Fluocymesterone (Halotestin)
Flutamide
Goserelin Acetate (Zoladex)
Hydroxyprogesterone Acetate (Megace)
Prednisone
Tamoxifen (Nolvadex)
Testolactone (Teslac)
Testosterone

Mitotic Inhibitors

Etoposide (VP-16, VePeside)
Teniposide (VM-26)
Vinblastine
Vincristine
Vindesine

Miscellaneous

Aminoglutethimide
Amsacrine (M-AMSA)
Diaziquone
L-Asparaginase
Levamisole
Methyl-GAG
Mitotane
Mitoxantrone (Novantrone)
Procarbazine (Matulane)
Razoxane

List of most antineoplastic drugs in current use compiled from:
D.S. Fischer & T.M. Knopf (1989), *The cancer chemotherapy handbook* (3rd ed.), Chicago: Year Book Medical; and Association of Community Cancer Centers (Spring, 1992), *Compendia-based drug bulletin*, Rockville, MD: