

Reproductive Toxins

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 kept with the UC Davis Laboratory Safety Manual or be otherwise readily accessible to laboratory personnel. Electronic access is acceptable. SOPs must be reviewed, and revised where needed, as described in the [UC Davis Laboratory Safety Manual](#). 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. The unique properties of each chemical must be considered before including it into a control band.

Date SOP Written:	<u>12/28/15</u>	Approval Date:	<u>Click here to enter a date.</u>
SOP Prepared by:	<u>Akiva Shalit-Kaneh</u>		
	<u>CLSC SOP Task Force</u>		
SOP Reviewed and Approved by (name/signature):	<u>REQUIRED - Insert Approver's Name & Signature</u>		
Department:	<u>Plant Biology</u>		
Principal Investigator/ Laboratory Supervisor:	<u>Stacey Harmer</u>	Phone:	<u>530-752-8101</u>
Lab Manager/ Safety Coordinator:	<u>Akiva Shalit-Kaneh</u>	Phone:	<u>530-752-8102</u>
Emergency Contact(s):	<u>EH&S (safety specialist helpline)</u>	Phone:	<u>530-752-1493</u>
	<u>Fire Department</u>		<u>911</u>
Location(s) covered by SOP:	Building: <u>LSA</u>	Lab	
	Room #(s): <u>2123, 2119, 2115, 2110, 2124</u>	Phone:	<u>530-752-8102</u>

1. HAZARD OVERVIEW

There is a broad spectrum of chemicals that pose the potential to be Reproductive Toxins (e.g., mutagenicity, teratogenicity, etc.). Recognition of the hazards associated with the transportation, handling, storage, and disposal of these materials is essential.

2. HAZARDOUS CHEMICAL(S)/CLASS OF HAZARDOUS CHEMICAL(S)

Reproductive Toxins are substances or agents that may have adverse effects on various aspects of reproduction in both women and men, including fertility, gestation/pregnancy, birth defects, lactation, genetic effects, and general reproductive performance. Many chemicals used in laboratory study and research, industrial processes, and daily activities pose reproductive hazards.

Materials that meet this criteria can be identified using the following Globally Harmonized System Hazard Codes, which should be included on current Safety Data Sheets:

1. H340 - May cause genetic effects;
2. H341 - Suspected of causing genetic effects;
3. H360 - May damage fertility or the unborn child;
4. H361 - Suspected of damaging fertility or the unborn child; and
5. H362 - May cause harm to breast-fed children.

A few examples of common Reproductive Toxins used at the UC Davis campus include, but are not limited to, the following:

1. Chloroform
2. Toluene
3. Benzene
4. Lead
5. Xylenes
6. Anesthetic gases (*e.g.*, halothane, isoflurane, etc.)

Reproductive Toxins used in the Harmer lab include: Ethidium Bromide (EtBr), Formamide, Chloroform, Sodium Borate, Boric Acid, Acryl amid, Basta (Glufosinate-ammonium), Phenol, Beta-estradiol, Streptomycin Sulfate, Tetracyclin, Kanamycin.

EtBr is a mutagen (may cause genetic damage) and is moderately toxic after an acute exposure. EtBr can be absorbed through skin, and will stain it purple. EtBr is an irritant to the skin, eyes, mouth, and upper respiratory tract.

Formamide is an **irritant, corrosive, reproductive hazard, and mutagen**. Targeted organs include blood, central nervous system, liver, kidney, blood, central nervous system, liver, kidney An **irritant** to eyes, skin, mucous membranes and respiratory system. Harmful by ingestion, inhalation or skin absorption. Readily absorbed through the skin. Formamide is used in hybridization solutions for hybridization of nucleic acid duplexes.

Chloroform is a SELECT CARCINOGEN and reproductive hazard.

It is harmful if swallowed. Chloroform is irritating to eyes, respiratory system and skin. It poses danger of serious damage to health by prolonged exposure through inhalation and if swallowed.

Over pressurized containers of chloroform are potentially explosive. Chloroform is commonly used in DNA purification procedures in biology and biochemistry and as a solvent in organic synthesis.

Sodium Borate Causes serious eye irritation. May damage fertility or the unborn child. Harmful to aquatic life with long lasting effects.

Boric Acid is suspected of damaging fertility or the unborn child. Is used to make Gel running buffer TBE.

Acrylamide and bis-acrylamide are both select carcinogens, reproductive hazard and neurotoxins. They are used in polymerized form to analyze the size of proteins and protein-DNA complexes in gel electrophoresis. Acrylamide is purchased as a liquid solution which is highly toxic due to the high potential of absorption through the skin yet this exposure is diminished when acrylamide is in its polymerized form. Acrylamide is also toxic if in contact with skin or swallowed. It is irritating to eyes and skin. It may cause sensitization by inhalation and skin contact and is readily absorbed through skin. The target organs are nerves and kidneys.

Beta-estadiol : Suspected of causing cancer. May damage fertility or the unborn child. May cause harm to breast-fed children.

Phenol (We generally use it in Trizol)- Toxic if inhaled. Material is extremely destructive to the tissue of the mucous membranes and upper respiratory tract. Toxic if absorbed through skin. Causes skin burns. Causes eye burns. Toxic if swallowed.

Basta (Glufosinate-ammonium) is a herbicide - Harmful if swallowed, in contact with skin or if inhaled May damage fertility or the unborn child. May cause damage to organs through prolonged or repeated exposure.

Streptomycin - Harmful if swallowed. Suspected of damaging fertility or the unborn child.

Tetracyclin - Causes skin irritation. Causes serious eye irritation. May cause respiratory irritation. Suspected of damaging fertility or the unborn child. May cause harm to breast-fed children.

3. ENGINEERING/VENTILATION CONTROLS

The following is a general plan for all Reproductive Toxins:

- A. Use containment devices (*e.g.*, chemical fume hoods, glove boxes, 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.*, certified laboratory chemical fume hood). 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 Reproductive Toxins without engineering or ventilation controls, you must contact the Chemical Hygiene Officer or healthandsafety@ucdavis.edu for an exposure assessment.

When handling reproductive toxins in the lab use the chemical fume hood in room 2123. If weighing is necessary use the tare method described above in 3.c.

All work with ethidium bromide is to be done in an "ethidium bromide" designated area in order to keep ethidium bromide contamination to a minimum. Gels are run in room 2124. Any persons in this area are required to wear personal protective equipment. Safety shower and eye wash stations should be easily accessible where ethidium bromide is used. Persons operating gel system are to take added caution when using ultraviolet light to visualize gels. Persons are to make sure the UV light is off before they open the UV box and that the UV light is turned off when they are finished. Avoid exposing unprotected skin and eyes to intense UV sources.

4. ADMINISTRATIVE CONTROLS

The following elements are required:

1. Complete the [UC 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, including any applicable laboratory-specific Laboratory Safety Plan(s), prior to receiving unescorted access to the laboratory;
3. Demonstrate competency to perform the procedures to the Principal Investigator (PI), 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 [UC SDS](#));
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 the Reproductive Toxins described in this SOP; and
10. Abide by the laboratory-specific working alone SOP, if applicable.

For Reproductive Toxins, the following are also required:

11. Work surfaces should be protected (*e.g.*, disposable absorbent bench paper, aluminum foil, etc.) and must be decontaminated after each use.

Laboratory personnel considering pregnancy or who become pregnant may want to consult the additional information on the [Reproductive Health webpage](#).

Formamide and Chloroform are to be kept in the flammable safe cabinet beneath the chemical fume hood in room 2123. Boric acid is to be kept in the Acid cabinet beneath the chemical fume hood room 2123. Acrylamide is to be kept in the flammable proof refrigerator in room 2110. EtBr liquid aliquotes are kept in room 2124, solid EtBr is kept on the shelf behind the scales in room 2115 in an area designated for carcinogens and mutagens.

Beta-estradiol - Keep container tightly closed in a dry and well-ventilated place.

Phenol (Trizol) – is kept at 4c in the flammable safe refrigerator in room 2110.

Tetracyclin - Conditions for safe storage, including any incompatibilities Keep container tightly closed in a dry and well-ventilated place. Recommended storage temperature: -20 °C Keep in a dry place. Keep in a dry place.

Kanamycin - May damage fertility or the unborn child.

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 is required for work with Reproductive Toxins:

- A. Eye Protection: Eye protection is required for all work with Reproductive Toxins.
 - 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. If a risk of fire exists, a flame-resistant laboratory coat that is NFPA 2112-compliant should be worn.
 - ii. 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: When 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.

When handling reproductive toxins use your assigned lab coat, safety glasses and gloves. Work in the Chemical fume hood and clearly label any aliquot you are making as a reproductive hazard along with any other hazard category the substance falls into.

6. SPILL AND EMERGENCY PROCEDURES

Follow the guidance for chemical spill cleanup from [SafetyNet #13](#) and/or the [UC Davis Laboratory Safety Manual](#), unless specialized cleanup procedures are described below. Emergency procedure instructions for the UC Davis campus and UCD Medical Center are contained in the [UC Davis Laboratory Safety Manual](#) and the [Emergency Response Guide](#) (which must be posted in the laboratory). All other locations must describe detailed emergency procedure instructions below.

For spill clean up refer to safetyNet #13, if you do not feel confident with the task ask other lab members for assistance. The Harmer lab spill kit is located in the cabinet beneath the sink to the left of the chemical fume hood in room 2123.

INSERT IF APPLICABLE - Descriptions of any specialized emergency procedures for locations outside of the UC Davis main campus and the UCD Medical Center campus.

7. WASTE MANAGEMENT AND DECONTAMINATION

Hazardous waste must be managed according to [Safety Net #8](#) using the appropriate [label](#). In general, hazardous waste must be removed from your laboratory within 9 months of the accumulation start date; refer to the [timeline for waste disposal](#). Hazardous waste pick up requests must be [completed online](#).

Chloroform - for liquid waste use liquid waste container in the chemical fume hood room 2123. For solid waste such as tips and tubes use double bagged solid waste bag also in the chemical fume hood, if such a container is not present or full contact the lab's safety officer. Waste container will be properly labeled and collected by EH&S.

Same for Formamide Acryl amide, Boric acid, Phenol. For Ethidium Bromide used gels are dried in the hood double bagged and collected by EH&S. Buffer used for running EtBr containing gels is stored in containers in room 2124 and is regularly decontaminated by absorbant material, 'tea bags', which are collected by EH&S. Tips in contact with EtBr are double bagged and also collected by EH&S.

Decontamination procedures vary depending on the material being handled. The toxicity of some materials can be neutralized with other reagents. All surfaces and equipment should be wiped with the appropriate cleaning agent following the dispensing or handling of reproductive hazards to prevent accumulation. Decontaminate vacuum pumps or other contaminated equipment before removing them from the designated area or before resuming normal laboratory work in the area.

Carefully inspect work areas to make sure no hazardous materials remain. Clean contaminated work areas with an appropriate cleaning agent, and dispose of cleaning materials properly. Be sure all ignition sources are secured before beginning clean-up with flammable liquids.

Chloroform - Clean contaminated surfaces with soap and water and paper towels. Dispose of the paper towels as hazardous waste. All spent chloroform is to be disposed as hazardous waste. Dispose of all plastic tubes and tips that have held chloroform as hazardous waste.

Same for Formamide, Acryl amide, Boric acid. Phenol.

Upon completion of work with Reproductive Toxins and/or decontamination of equipment, remove gloves and/or PPE to wash hands and arms with soap and water. Additionally, upon leaving a designated Reproductive Toxin work area remove all PPE and wash hands, forearms, face and neck as needed. Contaminated clothing or PPE should not be worn outside the lab. Soiled lab coats should be sent for professional laundering. Grossly contaminated clothing/PPE and disposable gloves must not be reused.

8. DESIGNATED AREA

Designated area(s) are required for use and storage of Reproductive Toxins. Such areas must be clearly marked with signs that identify the chemical hazard and include an appropriate warning; for example: DANGER! REPRODUCTIVE TOXIN WORK AREA!

The designated area for working with reproductive toxins is the chemical fume hood in room 2123.

9. DETAILED PROTOCOL

When using reproductive toxins use gloves a lab coat and safety glasses. Work with the substance in the chemical fume hood, if needed aliquote carefully into a new container and label that container with all the hazard information provided on the original container. If weighing is necessary use the tare method described above in 3.c. Dispose of all waste, liquid or solid in the appropriate waste container located in the chemical fume hood. In case of a spill refer to safety net #13, in case of contamination of glass ware or other equipment clean with paper towels water and soap. Dispose of paper towels in double bags and have them collected by EH&S.

Documentation of Standard Operating Procedure Training

(Signature of all users is required)

- ✓ Prior to using **Reproductive Toxins**, laboratory personnel must be trained on the hazards involved in working with this SOP, how to protect themselves from the 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:

Name	Signature	Trainer Initials	Date