Laboratory-Specific Standard Operating Procedures

TITLE: SOP for the safe use of Cyclophosphamide

Date: **6/22/18** Review Date: Revised:

Principal Investigator:

Authors (Names):

Department, Building, Room(s):

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This SOP must be kept on file for all laboratory employee training and review.

Section 1: (Check One)
There are three methods that can be used to write SOPs. They are: by process (distillation, synthesis, chromatography, etc.); by individual hazardous chemical (benzene, phenol, arsenic, etc.); and by hazardous chemical class (flammable, corrosive, oxidizer, etc.).

_____ Process ___X__ Chemical _____ Hazard Chemical Class

Section 2: Describe Process, Hazardous Chemical or Hazard Class
This SOP presents guidelines and procedures for the safe use of Cyclophosphamide. In addition to use of this SOP, persons working with Cyclophosphamide should be thoroughly familiar with general guidelines for high hazard chemicals identified in EHS 200.09, High Hazard Chemical Policy and all other applicable LSUHSC chemical safety policies. Observe all lab-specific safety procedures as well as guidance provided by the chemical supplier. The current chemical-specific Safety Data Sheet (SDS) must be available and reviewed prior to use.

Cyclophosphamide (CAS ID #: 50-18-0) is a cytotoxic nitrogen mustard derivative that is classified as an alkylating agent. In solid form, it is an odorless, fine white crystalline powder with a slightly bitter taste. It is widely used in cancer chemotherapy. Other clinical uses include immunosuppressive therapy and treatment for autoimmune disorders such as rheumatoid arthritis and Wegener's granulomatosis. Common synonyms include Cytoxan, Neosar, Endoxan, and CPH.

Section 3: Potential Hazards
There are no established safe levels of exposure to cytotoxic drugs. Cyclophosphamide may damage fertility or cause genetic defects. Women who are pregnant, breast feeding, or planning pregnancy must not handle cytotoxic drugs. Exposure may occur during preparation and

administration of the drugs, handling of body fluids from animals receiving cytotoxic drugs, handling and disposal of cytotoxic wastes and related trace contaminated material, and transportation of cytotoxic drugs. Primary routes of exposure include: inhalation, accidental injection, and dermal absorption.

- Physical Hazards
  - Combustible (produces highly toxic fumes of phosphorous oxides, nitrogen oxides, and hydrogen chloride).
  - Decomposes under the influence of strong oxidizing agents, moisture, and light.
- Health Hazards
  - Toxic if swallowed.
  - May cause genetic defects.
  - May cause cancer.
  - May damage fertility or the unborn child.
  - May cause harm to breast-fed children.
  - Causes damage to organs (single exposure)
  - Causes damage to organs through prolonged or repeated exposure

Section 4: Personal Protective Equipment
Identify the required PPE. If a respirator is required, contact EH&S before using. Protective clothing and equipment is not a substitute for adequate engineering controls. PPE must be selected on the basis of the hazards present, the type of materials used, and the manner in which they will be handled. Always consult with the PI and lab-specific SOP to determine task appropriate PPE before carrying out any procedures. In addition to the general guidance below, basic laboratory PPE must be worn when working with cyclophosphamide.

- Lab coat.
- Double-gloving is recommended.
- Full-face shield must be used when conducting tasks posing potential for generation of aerosol or droplets.
- NIOSH-approved respirator with equipped with combination filter cartridge must be worn for certain procedures.
- Animal Care protective equipment: disposable back-closure gown or protective suits (disposable, one-piece, and close fitting at ankles and wrists), hair covering, and overshoes.

For more information about general PPE requirements, refer to EHS-400.03, Personal Protective Equipment.

Section 5: Engineering Controls
Describe engineering controls that will be used to prevent or reduce employee exposure to hazardous chemicals.

- Any handling of cyclophosphamide, including weighing, solution preparation, and drawing doses must be done in a fume hood or Class II Type B biological safety cabinet (BSC).
- All administrations, cage manipulations, and handling of animals that have been administered cyclophosphamide must be performed in a certified BSC for three (3) days after the final administration.

- Tools (syringes, blades, and safety needles where possible) should be adapted for BSL2.
- Animals must be appropriately restrained and/or sedated prior to administering injections and other dosing methods.

Section 6: Special Handling and Storage Requirements
List storage requirements for hazardous chemicals involved with the SOP, including specific area, and policies regarding access to chemicals. Special procedures such as dating peroxide formers are appropriate here. Is a special "designated area" required?

- Handling Precautions
  - Work with cyclophosphamide must be done in a properly designated area (e.g. tape off an area of the benchtop for carcinogen handling and post signage).
  - Do not get in eyes, on skin, or on clothing.
  - Avoid inhalation of dust, vapor, or mist.
  - Avoid formation of dust.
  - Animal laboratories – Research staff will inform animal care staff ahead of time that cyclophosphamide will be used.
    - Agent may be excreted by the animals within the first 24 hours post injection. Treat animals as hazardous for a minimum of three (3) days.
    - Cages must be properly labeled indicating date and time of administration.
    - Dispose of needles in approved sharps container immediately following use.
    - Animals must be housed in the Animal Care Chemical Containment Room.
    - Animal handling and housing maintenance must be performed within the Animal Care chemical containment room.
    - Cages are only to be opened under a BSC or Animal Change Hood (ACH).
    - On the first cage change after the final administration, all contaminated bedding must be disposed of as regulated medical waste for incineration only.
  - Know the location of the nearest emergency safety shower and eyewash station.
  - Always wash hands immediately after work is complete or when gloves are removed.
- Storage Precautions
  - Store tightly closed containers within a secondary unbreakable outer container.
  - Store in a well-ventilated space or fume hood.
  - Refrigerate if needed.
  - Keep away from direct light (light sensitive, rapidly decomposes).
  - Store separately from incompatible chemicals.

Section 7: Spill and Accident Procedures
Indicate how spills or accidental release will be handled. List the location of appropriate emergency equipment. Any special requirements for protection of personnel from exposure should be identified here.

- For Accidents:
  - In the event of a fire, suitable fire extinguishing media includes use of water spray, alcohol-resistant foam, dry chemical or carbon dioxide.
  - Skin contact – Thoroughly rinse affected areas in emergency shower with water for 15 minutes. Remove all contaminated clothing.

- Eye contact – Remove contact lenses if applicable and flush eyes with copious amounts of saline or water for at least 15 minutes.
- Inhalation – Leave the area and move to fresh air.
- In the event of personal contamination, call campus police (568-8999) and immediately seek medical attention.
- Seek physician advice regarding possible long term health effects and potential recommendation for medical monitoring.

- For Spills:
  - Liquid spill – Use absorbent paper to pick up all spilled material.
  - Powder spill – Wet-wipe with cloth/gauze that is dampened with soapy water to pick up all spilled material.
  - Avoid dust and aerosol formation.
  - Use tongs, a tweezer, or puncture-proof hand protection when picking up broken glass. Place any broken glass into approved sharps container.
  - The spill material should be completely removed and the area rinsed with water and then cleaned with detergent. The spill cleanup should proceed progressively from areas of lesser to greater contamination. The detergent should be thoroughly rinsed and removed.
  - Dispose of contaminated materials (gloves, wipes, etc.) as hazardous waste
  - General procedures for chemical spills are addressed in EHS-200.02, Chemical Spill Response Policy and Procedures.

Incident and accident reporting must be done electronically via the on-line fillable forms located on the EHS website. For more information about appropriate form selection, refer to EHS-400.06, Incident and Accident Reporting and Investigation Policy.

Section 8: Decontamination Procedures

Specify decontamination procedures to be used for equipment, glassware, and clothing: including equipment such as hoods, lab benches, and controlled (special "designated area") areas within the lab.

- Decontaminate fume hood and BSC surfaces, equipment, utensils, and glassware contaminated with cyclophosphamide.
- Any contaminated surface area must rinsed with water and then cleaned with detergent. The spill cleanup should proceed progressively from areas of lesser to greater contamination. The detergent should be thoroughly rinsed and removed.
- Depending on the work procedure, all cleaning activities must be conducted within the fume hood, BSC, or ACH.
- Equipment and work surfaces must be routinely cleaned with appropriate disinfectant.
- Dispose of contaminated materials (gloves, wipes, etc.) as hazardous waste.

Section 9: Waste disposal Procedures
Cyclophosphamide must be disposed of as hazardous waste and in accordance with EHS 200.04, Chemical Waste Management Procedures.

- Do not let this chemical enter the environment.
- Double-bag dry waste using sealable transparent bags.
- Dispose of all protective apparel (gown, gloves, goggles, and respirator) as hazardous waste
- Store waste in properly labeled closed containers, in secondary containment, and in a designated storage location.
- To request a pickup of chemical waste, authorized individuals must use the Facility Services online service request work order system.