Laboratory Specific Standard Operating Procedures

TITLE: SOP for the safe use of Strychnine and related compounds (Strychnine sulfate, phosphate, and nitrate)

Date: **7/20/18** Review: Date Revised:

Principal Investigator:

Authors (Names):

Department, Building, Room(s):

Contact Phone Number:

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 strychnine (CAS # 57-24-9). In addition to use of this SOP, persons working with strychnine should be thoroughly familiar with general guidelines for high hazard chemicals identified in the High Hazard Chemical Policy (EHS 200.09) and all other applicable LSUHSC chemical safety policies. All current applicable Safety Data Sheets (SDSs) should be available and reviewed prior to use.

Strychnine has the chemical formula $C_{21}H_{22}N_2O_2$. Strychnine is a potently bitter, solid white to light yellow crystalline alkaloid. It is a highly toxic chemical that is manufactured as a pesticide for small vertebrate infestations. The chemical is an alkaloid and is typically obtained from the *Strychnos* family. Other names for strychnine include: *Certox, Nux vomica, Strychinos, Strychnin, Strychnos, Strychnidin-10-one, and EPA Pesticie Chemical Code: 076901*.

Section 3: Potential Hazards
Physical Hazards

- Decomposition via heat results in fumes and vapors that may result in respiratory tract irritation, bronchitis, pneumonitis, or pulmonary edema.
- Incompatibilities include: strong oxidizers, alkalis, benzoates, bromides, iodides, dichromates, salicylates, tannic and picric acids, borax, alkaloid precipitants, piperazine, and potassium-mercuric iodide (not if acacia is present) (refer to SDS for full list).

Health Hazards

- Strychnine is **EXTREMELY** toxic. **Death** can occur through any of the routes of entry to the body (inhalation, ingestion, absorption) with estimated doses of **5 to 15 mg**.
- Strychnine's permissible exposure limit (PEL) is .15mg/m^3.
- Strychnine is an irritant to the eyes and skin.
- Exposure symptoms include: central nervous system stimulations, cyanosis, acidosis, neurological effects, liver and kidney damage, increased blood pressure, stiff neck, restlessness, anxiety, increased acuity of perception, increased reflex excitability, tetanic convulsions with opisthotanos, muscle spasms, paralysis, convulsions, hematemesis, shock, coma, and potentially death. Effects may be delayed.
- Over-exposure symptoms include: painful cramps and spasms, nausea, vomiting, diarrhea, stiffness, seizures, hyperthermia, metabolic and respiratory acidosis, rhabdomyolysis (the breakdown of muscle tissue), renal failure, respiratory failure, and/or cardiac arrest.
- **NOTE**: - Strychnine is rapidly oxidized in the liver. Be aware that 20% of the dose can be excreted **unchanged**.

An employee demonstrating symptoms which might be a result of exposure to strychnine shall report immediately to supervisor who shall request an evaluation by EH&S.

Section 4: Personal Protective Equipment

- Proper Laboratory Attire - pants or dresses/shorts below the knees, sleeved shirt, and close-toe shoes.
- Eye/Face Protection
  - Chemical goggles or safety glasses with side shields are required for all circumstances of use.
  - Ordinary (street) prescription glasses do not provide adequate protection.
  - Face shields in conjunctions with safety glasses are recommended.
- Skin Protection
  - Lab Coat - fully buttoned lab coat with sleeves extending to the wrists. Coat may be reused before laundering if it has not been contaminated with strychnine.
  - Chemical Apron – utilize a chemical apron in conjunction with a lab coat if the procedure(s) calls for a large amount of strychnine and/or if there is an increased chance of splashing.
  - Hand Protection
    - Utilize two pair of nitrile gloves when working with strychnine (double glove) to prevent exposure. Inspect gloves frequently due to toxicity concerns. Gloves should be changed frequently to minimize chance of exposure due to penetration or rupture.
    - Laboratory personnel should thoroughly wash hands with soap and water before and immediately upon removal of gloves.
  - Footwear – Utilized closed toe leather shoes or boots made of polyvinyl alcohol (PVA).
- Respiratory Protection - EH&S (568-6585) should be contacted prior to initial use (and when processes of use change) of strychnine to evaluate exposures and need for respiratory protection.
  - Always guard against aspiration into the lungs. Utilize approved equipment when necessary.

Refer to EHS-400.03, Personal Protective Equipment for more information.

Section 5: Engineering Controls

- Substitute with a different chemical if practicable.
- Purchase strychnine in the smallest practical amount.
- Dilute strychnine as much as practicable.
- Exhaust ventilation or other engineering controls should be utilized to keep the airborne concentrations of vapors below their respective threshold limit value.
- Strychnine must be prepared and handled in a certified chemical fume hood.
  - Remove all incompatibles in this work area.
  - Work with strychnine should be done over secondary containers.
  - Use of a Biological Safety Cabinet is especially not appropriate for working with strychnine.
  - Work at least 6" inside of a fume hood and set sash at lowest possible position.
  - The working surfaces of any fume hood for which strychnine is used should be protected to ensure containment of any spills. The side and back walls shall be covered to a minimum height of 12"
  - Any fume hood for which strychnine is used shall be posted with a warning sign that identifies the hazards and necessary controls.
- Wash hands before and after working with strychnine.
- Ensure an Emergency Wash Station is available for use.

Section 6: Special Handling and Storage Requirements

- Strychnine and concentrated solutions should be secured from unauthorized access and placed in secondary containment with appropriate signage indicating the hazards.
- Ensure the container is kept tightly sealed, kept upright, in a dry, cool, and well-ventilated place. Containers are to be carefully resealed.
- Containers holding strychnine shall be closed when not in use.
- Strychnine shall be kept away from heat, air, light, and moisture.
- Strychnine shall be kept away from all incompatibles.
- Avoid strong oxidizing agents, reducing agents, alkali hydroxides, bromides, carbonates, and iodides.
- Follow all general safe work practices when working with strychnine (no eating, no chewing gum, no drink, no pipetting by mouth, etc.).
- Utilize the smallest amount necessary for procedures.
- Avoid dust formation when handling strychnine.
- When moving strychnine acid to a chemical hood, do not remove it from the secondary containment until it is in the fume hood.
- Keep strychnine away from all heat and ignition sources. This includes direct sunlight.
- Wear appropriate PPE. Especially utilizing proper respiratory protection. Avoid breathing strychnine vapors. Ensure adequate ventilation.
- Prior to conducting any work with strychnine, the Principal Investigator must provide training to his/her laboratory personnel, specific to the hazards involved in working with this substance, work area decontamination, and emergency procedures, to include review of this SOP and applicable SDS.

Section 7: Spill and Accident Procedures

- The availability, location, and contents of chemical spill clean-up kits must be confirmed prior to handling or beginning any work with strychnine.
- Immediately notify all lab personnel of spills (with the details of the spill and actions being taken) and regulate access to the area.
- Eliminate all ignition sources. Keep combustibles away from the spill.
- Ventilate the contaminated area. However, avoid dust formation.

- Do not let the product enter drains, sewers, waterways, basements, or confined areas.
- Personnel cleaning the spill shall, at minimum, wear the same PPE required for handling/use.
- Laboratory personnel should be prepared to respond to spills in accordance with the guidance provided in LSUHSC Chemical Spill Response Procedure (EHS 200.02).
- All spills of strychnine should have personnel contact University Police.
  - Powder spills – Utilize a water dampened paper towel to clean up spill. Afterwards clean the area multiple times (at least three) with a detergent solution and paper towels. Treat waste paper towels as hazardous.
  - Liquid spills – Use absorbent pads or paper to soak up the solution. Afterwards clean the area multiple times (at least three) with a detergent solution and paper towels. Treat absorbent material as hazardous.
- Report all spills, regardless of size, to laboratory PI, who will report to LSUHSC EH&S.

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

- All exposed persons should seek immediate medical attention (subsequent to initial decontamination for skin contact).
- Where the eyes of any person may be exposed to perchloric acid, a safety shower/eye wash must be available for immediate use. Personnel must be aware of location of nearest Safety Shower/ Eye Wash and verify that a current certification of performance tag is present.
  - Personnel shall rinse eyes with copious amounts of cold water for at least **30** minutes. Ensure eyelids remain open by separating eyelids. Avoid rubbing of the eyes. Obtain medical assistance immediately.
- Where the skin of any person may be exposed to strychnine, immediately wash the area exposed areas of skin with soap and water. Remove contaminated clothing from the afflicted individual and treat clothing as hazardous. Continue flushing the skin of the victim and obtain medical assistance immediately.
- Whereas inhalation has occurred, transport the victim to a fresh air environment. If breathing is labored, provide oxygen. If breathing ceases, administer artificial respiration. Obtain medical assistance immediately.
- Whereas ingestion has occurred, rinse mouth, but do not induce vomiting. Do not provide baking soda or emetics. Never provide anything by mouth to an unconscious person. Obtain medical assistance immediately.
- All equipment, materials and work surfaces that have/potentially have become contaminated with strychnine shall be thoroughly cleaned with soap and water solution prior to storage and re-use.

Section 9: Waste Disposal Procedures

Strychnine waste is considered hazardous and must be disposed of in accordance with LSUHSC Chemical Waste Management Procedures (EHS 200.04).

- Waste storage – Strychnine waste should be placed in a tightly sealed and labeled plastic container with the words “HAZARDOUS WASTE” clearly marked, the primary constituents of the waste, and the starting accumulation date.
- To schedule a waste pick-up by EH&S, use the bob.lsuhsc.edu service request system.

Section 10: Laboratory Specific Protocol(s):

Attach laboratory protocol for specific handling and operational practices.