Standard Operating Procedure

Silver cyanide

*This is an SOP template and is not complete until: 1) lab specific information is entered into the box below 2) lab specific protocol/procedure is added to the protocol/procedure section and   
3) SOP has been signed and dated by the PI and relevant lab personnel.*

Print a copy and insert into your   
*Laboratory Safety Manual* and *Chemical Hygiene Plan*.   
Refer to instructions for assistance.

|  |  |
| --- | --- |
| **Department:** | Click here to enter text. |
| **Date SOP was written:** | Click here to enter a date. |
| **Date SOP was approved by PI/lab supervisor:** | Click here to enter a date. |
| **Principal Investigator:** | Click here to enter text. |
| **Internal Lab Safety Coordinator/Lab Manager:** | Click here to enter text. |
| **Lab Phone:** | Click here to enter text. |
| **Office Phone:** | Click here to enter text. |
| **Emergency Contact:** | Click here to enter text. |
| *(Name and Phone Number)* |
| **Location(s) covered by this SOP:** | Click here to enter text. |
| *(Building/Room Number)* |

**Type of SOP:** ☐ Process ☒Hazardous Chemical ☐ Hazardous Class

**Purpose**

Silver cyanide is a highly toxic chemical that can be metabolized to cyanide in the body upon exposure. Cyanide inhibits cellular respiration by inhibiting cytochrome oxidase. Symptoms of cyanide poisoning can occur. Contact with acids can liberate hydrogen cyanide, which is a very toxic, flammable gas or liquid. Silver cyanide is primarily used in silver plating but can also be used in the manufacture of antiseptics.

**Physical & Chemical Properties/Definition of Chemical Group**

CAS#: 506-64-9

Class: **Very toxic, irritant**

Molecular Formula: CAgN

Form (physical state): Solid, powder

Color: White, beige

Boiling point: N/A

**Potential Hazards/Toxicity**

Silver cyanide is highly toxic and may be fatal if inhaled, ingested, or absorbed through the skin. Contact with acids can liberate hydrogen cyanide, which is a very toxic, flammable gas or liquid. It causes irritation to the gastrointestinal tract, respiratory tract, skin, and eyes with serious damage. Ingestion of small amounts of cyanide can cause nausea, vomiting, drowsiness, dizziness, weakness, unconsciousness, convulsions, coma, and possibly death. May cause cardiac damage, central nervous system effects, liver and kidney damage, pulmonary edema, cyanide poisoning, and respiratory failure. Prolonged exposure may lead to a “cyanide” rash, characterized by itching, vesicular eruptions, and secondary infections. Effects may be delayed. Cyanide anions have a permissible exposure limit (PEL) of 5 mg/m3.

**Personal Protective Equipment (PPE)**

**Respirator Protection**

Use a full-face particle respirator with type N100 (US) respirator cartridges.

Respirators should be used only under any of the following circumstances:

* As a last line of defense (i.e., after engineering and administrative controls have been exhausted).
* When Permissible Exposure Limit (PEL) has exceeded or when there is a possibility that PEL will be exceeded.
* Regulations require the use of a respirator.
* An employer requires the use of a respirator.
* There is potential for harmful exposure due to an atmospheric contaminant (in the absence of PEL).
* As PPE in the event of a chemical spill clean-up process.

Lab personnel intending to use/wear a respirator mask must be trained and fit-tested by ORS and should contact occhealt@uga.edu. This is a UGA requirement described in more detail in the [UGA Respiratory Protection Plan](https://esd.uga.edu/sites/default/files/respiratoryprotection.pdf) and supported by the [Office of Research Occupational Health and Safety Program](https://research.uga.edu/ohsp/).

**Hand Protection**

Handle with gloves. Nitrile gloves are recommended.

NOTE: Consult with your preferred glove manufacturer to ensure that the gloves you plan on using are compatible with silver cyanide.

Refer to glove selection chart from the links below:

<http://www.ansellpro.com/download/Ansell_8thEditionChemicalResistanceGuide.pdf>

OR

<http://www.allsafetyproducts.biz/page/74172>

OR

<http://www.showabestglove.com/site/default.aspx>

OR

<http://www.mapaglove.com/>

**Eye Protection**

ANSI-approved, tight-fitting safety glasses/goggles. Face shields are recommended.

**Skin and Body Protection**

Lab coats should be worn. These laboratory coats must be appropriately sized for the individual and be buttoned to their full length. Laboratory coat sleeves must be of a sufficient length to prevent skin exposure while wearing gloves. Full-length pants and close-toed shoes must be worn at all times by all individuals that are occupying the laboratory area. The area of skin between the shoe and ankle should not be exposed.

**Hygiene Measures**

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

**Engineering Controls**

Chemical fume hood. Adequate exhaust and capture filtration.

**First Aid Procedures**

IMPORTANT: ESTABLISH A FIRST AID PLAN BEFORE WORKING WITH CYANIDES. ANTIDOTES SHOULD BE AVAILABLE ON SITE.

**If inhaled**

SPEED IS ESSENTIAL, OBTAIN MEDICAL AID IMMEDIATELY. POISON material. If inhaled, get medical aid immediately. Remove victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

**In case of skin contact**

POISON material. In case of contact, get medical aid immediately. Immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Destroy contaminated shoes.

**In case of eye contact**

Treat patient as for inhalation. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical aid immediately.

**If swallowed**

Get medical aid immediately. SPEED IS ESSENTIAL. A DOCTOR MUST BE NOTIFIED AT ONCE. POISON material. If swallowed, get medical aid immediately. Only induce vomiting if directed to do so by medical personnel. Never give anything by mouth to an unconscious person.

**Notes to Physician**

Prompt action is essential in all cases of contact. Exposure should be treated as a cyanide poisoning.

Symptoms of acute cyanide poisoning reflect cellular hypoxia and are often non-specific. A bradycardia, hypertensive and tachypneic patient suggests poisoning, especially if CNS and cardiovascular depression subsequently occurs. Immediate attention should be directed towards assisted ventilation, administration of 100% oxygen, insertion of intravenous lines and institution of cardiac monitoring. Obtain an arterial blood gas immediately and correct any severe metabolic acidosis (pH below 7.15).

Comprehensive treatment of acute cyanide intoxication requires support of vital functions. Cyanokit (contains hydroxocobalamin, an antidote indicated for the treatment of known or suspected cyanide poisoning) should be administered in conjunction with appropriate airway, ventilatory and circulatory support.

Each 2.5 g vial of hydroxocobalamin for injection is to be reconstituted with 100 mL of diluent (not provided with Cyanokit) using the supplied sterile transfer spike. The recommended diluent is 0.9% Sodium Chloride injection (0.9% NaCl). Lactated Ringers injection and 5% Dextrose injection (D5W) have also been found to be compatible with hydroxocobalamin and may be used if 0.9% NaCl is not readily available. The line on each vial label represents 100 mL volume of diluent. Following the addition of diluent to the lyophilized powder, each vial should be repeatedly inverted or rocked, not shaken, for at least 30 seconds prior to infusion.

Hydroxocobalamin solutions should be visually inspected for particulate matter and color prior to administration. If the reconstituted solution is not dark red or if particulate matter is seen after the solution has been appropriately mixed, the solution should be discarded.

* The starting dose of Cyanokit for adults is 5 g, (two 2.5 g vials) administered by IV infusion over 15 minutes.
* Depending upon the severity of the poisoning and the clinical response, a second dose of 5 g may be administered by IV infusion for a total dose of 10 g.
* The rate of infusion for the second 5 g dose may range from 15 minutes (for patients in extremis) to 2 hours based on patient condition.
* The recommended diluent is 0.9% Sodium Chloride injection.
* Diluent is not included with Cyanokit.
* There are a number of drugs and blood products that are incompatible with Cyanokit, thus Cyanokit may require a separate intravenous line for administration.

Please consult the following website for additional information on proper storage of Cyanokit, potential side-effects of treatment, chemical incompatibilities, drug interactions, warnings, and precautions.

(<http://www.druglib.com/druginfo/cyanokit/>)

**Special Handling and Storage Requirements**

**Precautions for safe handling:** Avoid contact with skin, eyes, and clothing. Avoid inhalation and ingestion. Avoid dust formation. Provide adequate exhaust ventilation. Handle and open container with care.

**Conditions for safe storage:** Keep container tightly closed in a cool, dry, and well-ventilated area. Never allow contact with water during storage. Do not store near acids. Light-sensitive. Store in poison room locked. Incompatible with acids and aluminum.

**Spill and Accident Procedure**

**Chemical Spill Dial 911**

**24-7 On-Call Response to Research, Environment, Health or Safety Concerns Dial 2-5561 from a campus phone or 706-542-5561 from a non-campus line.**

**Spill** – Follow the procedures set out in the [UGA Chemical and Laboratory Safety Manual.](http://research.uga.edu/docs/units/safety/manuals/Chemical-Laboratory-Safety-Manual.pdf)

[If there are any chemical-specific protocols for responding to a spill, insert them here or mark “none”:]

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# **Medical Emergency Dial 911**

**Life Threatening Emergency, After Hours, Weekends and Holidays** – Dial **911** or the emergency phone numbers listed at the beginning of the UGA Chemical and Laboratory Safety Manual.

*Note: All incidents that result in an injury or property damage must be reported to ORS / ESD using a University Incident/Accident Report.*

**Non-Life-Threatening Emergency** – Follow the instructions in the UGA Chemical and Laboratory Safety Manual.

*Note: All incidents that result in an injury or property damage must be reported to ORS / ESD using a University Incident/Accident Report.*

**Decontamination/Waste Disposal Procedure**

**For general hazardous waste disposal procedures, see Appendix H of the UGA Chemical and Laboratory Safety Manual.**

**Chemical Specific Procedures: [to be inserted or marked as “none”]**

Wearing proper PPE, sweep up or shovel avoiding dust formation. Do not flush with water. Dispose of the used chemical and contaminated disposables as hazardous waste.

**Safety Data Sheet (SDS) Location**

UGA personnel can access Online SDS through a link in the upper left corner of the ESD home page (<https://esd.uga.edu>) and logging in by using their UGA email user name and password.

**Protocol/Procedure (Add lab specific Protocol/Procedure here)**

Click here to enter text.

**NOTE**

Any deviation from this SOP requires approval from PI.

**Documentation of Training** (signature of all users is required)

* Prior to conducting any work with silver cyanide, designated personnel must provide training to his/her laboratory personnel specific to the hazards involved in working with this substance, work area decontamination, and emergency procedures.
* The Principal Investigator must provide his/her laboratory personnel with a copy of this SOP and access to the SDS provided by the manufacturer.
* The Principal Investigator must ensure that his/her laboratory personnel have attended appropriate laboratory safety training or refresher training within the last 12 months.

**Principal Investigator SOP Approval**

Print name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Signature\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Approval Date:

I have read and understand the content of this SOP:

|  |  |  |
| --- | --- | --- |
| **Name** | **Signature** | **Date** |
| Click here to enter text. |  | Click here to enter a date. |
| Click here to enter text. |  | Click here to enter a date. |
| Click here to enter text. |  | Click here to enter a date. |
| Click here to enter text. |  | Click here to enter a date. |
| Click here to enter text. |  | Click here to enter a date. |
| Click here to enter text. |  | Click here to enter a date. |
| Click here to enter text. |  | Click here to enter a date. |
| Click here to enter text. |  | Click here to enter a date. |
| Click here to enter text. |  | Click here to enter a date. |
| Click here to enter text. |  | Click here to enter a date. |
| Click here to enter text. |  | Click here to enter a date. |
| Click here to enter text. |  | Click here to enter a date. |
| Click here to enter text. |  | Click here to enter a date. |
| Click here to enter text. |  | Click here to enter a date. |
| Click here to enter text. |  | Click here to enter a date. |