First Aid Management of Cyanide Poisoning

Cyanide is a rapidly acting, potentially deadly chemical that can exist in various forms. Cyanide can be a colourless gas, such as hydrogen cyanide (HCN) or cyanogen chloride (CNCl), or in crystal form such as sodium cyanide (NaCN) or potassium cyanide (KCN).

Hydrogen cyanide gas is particularly hazardous. It is released when cyanide salts come into contact with any acid. Cyanide compounds are used in many industrial applications such as fumigating, electroplating and chemical synthesis but their use in academic research laboratories is normally on a much smaller scale.

All staff who are working with or storing cyanides at UQ should undergo specific training. This training should include health hazards, personal protective measures and emergency first aid procedures. Specific treatment for cyanide exposures may include a Cyanide Antidote Kit.

Health hazards information
Cyanide can affect the body if:

- It is breathed in as vapour or dust:
- The liquid or vapour is absorbed through the skin;
- It is ingested.

Local Health Effects
The vapour or liquid will cause irritation of the mucous membranes in the eye, nose and throat and may cause skin irritation.

General Health Effects
Symptoms of mild or early cyanide poisoning are: general weakness, heaviness of the arms and legs; difficulty breathing; headaches, giddiness, nausea, vomiting, skin irritation and rashes, irritation of the mucus membranes in the nose, mouth and throat.

The odour of bitter almonds may be detected on the victims breath but this characteristic can not be relied on as an indicator of cyanide exposure as not all persons have the ability to detect this odour.

Symptoms of severe cyanide poisoning are:

- nausea and vomiting
- gasping for breath
- loss of consciousness
- convulsions
- death
Work safety

- Before working with cyanide a risk assessment must be completed and approved by the supervisor.
- Workplaces that have assessed their risk as significant, should stock the cyanide antidote Cyanokit. - Contact the Occupational Health Nurse Adviser for advice
- Staff and students using cyanide must not work alone.
- Workplaces that do not stock the antidote should only work with cyanide from 8.30am to 4:30 pm weekdays (the hours that the University Health Service is open).
- The cyanide antidote is also available at the Health Service, St Lucia Campus and from chemical stores on short-term loan.

Workplaces that use cyanide infrequently can access a cyanide antidote kit on short term loan from Chemical stores - Contact Mr Robert Rose, University Chemical Store, Telephone; 33654437 or email; chemorders@uq.edu.au.

Training General

All workers who work near the areas where cyanide is used or stored must be trained:

- To recognise an unsafe situation;
- In evacuation procedures;
- In basic rescue and first aid, and the location of the antidote kit.

Designated personnel

First Aid Officers (trained to Advanced level) and key workers in cyanide handling and storage areas must be trained to;

- carry out rescue in a hazardous environment;
- recognize the signs and symptoms of cyanide poisoning;
- implement first aid management of cyanide poisoning.

First aid: management of cyanide poisoning

Rescue action by fellow workers

1. Call UQ Security on 336 53333 or ring 000 if off campus.
2. Avoid danger to rescuers by using positive pressure self-contained breathing apparatus and use impervious gloves to handle contaminated skin and or clothes.
3. If it is safe to do so, remove the victim from the contaminated area and into fresh air.
4. Remove contaminated clothing and wash any parts of the body that have been splashed with cyanide or covered with cyanide dust. Personnel assisting with removal of cyanide must wear appropriate PPE such as disposable paper suits/lab coats and nitrile gloves, as well as eye protection. Preferably, cyanide dust should be wiped carefully from the body using a damp cloth, and waste cloths collected into plastic bags which can be sealed. Production of aerosols containing cyanide during the washing off process must be avoided.
First Aid

1. Follow the procedure for rescue.
2. If breathing has stopped or is abnormal, begin Cardio Pulmonary Resuscitation using oxygen (at 15L/min) and bag and mask resuscitation equipment. **Expired air resuscitation using an approved resuscitation facemask should only be used in the absence of oxygen equipment.**
3. Continue resuscitation until medical assistance arrives.
4. Look for firm evidence that cyanide poisoning has actually occurred (i.e. cyanide splash or spill, breath smell of bitter almonds, several people affected, etc.).
5. If cyanide poisoning is suspected or if any evidence of cyanide poisoning is found, inform Security, affected personnel and ambulance drivers.
6. Arrange urgent transfer to the nearest hospital or medical centre. Maintain resuscitation if necessary and if you have an emergency cyanide kit send the kit with the patient (see Cyanide Antidote Kit). Request that a blood sample for cyanide be taken. Identify the specific compound containing cyanide and arrange for a hard copy of the appropriate Chemical Safety Data Sheet to be transferred with the patient to be passed on to medical staff.

Notes

At workplaces where a risk assessment has revealed a risk of cyanide poisoning, the following items should be kept in an accessible and convenient position:

- A positive pressure resuscitation bag valve and mask
- A source (cylinder) of oxygen, and oxygen flow delivery system
- Cyanide Antidote Kit.

Operating a CPR bag/valve mask and oxygen for resuscitation as well as external cardiac massage are skills which need to be taught by a qualified instructor, usually in an Advanced First Aid Course.

If it is decided that a cyanide antidote should be kept, contact the Occupational Health Nurse on 33654883 or email f.coulthard@uq.edu.au.
The antidote used at the University Health Service is called Cyanokit.

Medical treatment by a medical practitioner

(See also Cyanide Antidote Kit)

- Support breathing and circulation.
- Give 100% oxygen and continue until it is no longer required. Flow rate at 15L/min
- Equipment for emergency endo-tracheal intubation should be immediately available.

If a diagnosis of cyanide poisoning is firm and patient is unconscious or lapsing into unconsciousness:
1. Insert indwelling cannula into vein:
2. Take blood to confirm the diagnosis later (into heparinised tube)
3. Prepare cyanokit for infusion as per instructions- **see Appendix 1**
4. Continue oxygen and respiratory circulatory support for as long as necessary.

Cyanide antidote kit

The kit should be contained in a clearly marked box, labeled:
Cyanide Antidote Kit.
Contents

1. Approved Management of Cyanide Poisoning Information.
2. A copy of the appropriate MSDS for the cyanide product in use;
3. Guedel or Brooks Airway
4. Elasticized tourniquet
5. Disposable indwelling intravenous cannulae
6. 2ml, 10ml and 20ml sterile disposable syringes and needles
7. Heparinised blood sample tubes
8. Skin pep swabs, dressing adhesive tape and scissors
9. 2x 100ml bags of IV Normal Saline 0.9%
10. Cyanokit x 1 with instruction sheet.

Expiry dates should be regularly checked.
Cyanide Antidote should ONLY be administered by a medical practitioner who is certain cyanide poisoning has occurred.

Acknowledgments:


http://occmed.oxfordjournals.org/content/54/2/82.short

Appendix 1

About CYANOKIT®

Easy to Prepare and Administer in 4 Simple Steps

Two 2.5-g Vials

Recommended Dosing

The starting dose of CYANOKIT® for adults is 5 g (contained in 2 x 2.5g vials), administered by IV infusion over 15 minutes (approximately 15 mL/min)
Depending upon the severity of the poisoning and the clinical response, a second dose of 5 g may be administered by IV infusion up to a total dose of 10 g
The rate of infusion for a potential second dose may range from 15 minutes (for patients in extremis) to 2 hours, as clinically indicated

Preparation and Administration

The starting dose of CYANOKIT® for adults is 5 g (ie, both 2.5-g vials), administered by IV infusion over a total of 15 minutes (approximately 15 mL/min), 7.5 minutes per vial
Depending upon the severity of the poisoning and the clinical response, a second dose of 5 g may be administered by IV infusion up to a total dose of 10 g
The rate of infusion for a potential second dose may range from 15 minutes (for patients in extremis) to 2 hours, as clinically indicated

Starting Dose: 5 g (two 2.5-g vials)

Reconstitute: Add 100 mL of 0.9% Sodium Chloride Injection* to vial using sterile transfer spike. Fill to line. Vial in upright position.

Mix: Rock or rotate vial for 30 seconds to mix solution. Do not shake.
Infuse First Vial: Use vented IV tubing to hang and infuse over 7.5 minutes.
Infuse Second Vial (repeat steps 1 and 2 before second infusion): Use vented IV tubing to hang and infuse over 7.5 minutes.

CYANOKIT® solutions should be visually inspected for particulate matter and color prior to administration
Discard solution if particulate matter is present or solution is not dark red
Caution should be exercised when administering other cyanide antidotes simultaneously with CYANOKIT®, as safety has not been established. If a decision is made to administer another cyanide antidote with CYANOKIT®, these drugs should not be administered concurrently in the same IV line

Preparation and Administration of Cyanokit

CYANOKIT® Incompatibility Information

Physical incompatibility (particle formation) and chemical incompatibility were observed with the mixture of CYANOKIT® in solution with select drugs that are frequently used in resuscitation efforts
Chemically incompatible with sodium thiosulfate and sodium nitrite
Reported to be incompatible with ascorbic acid
Simultaneous administration of CYANOKIT® and blood products (whole blood, packed red cells, platelet concentrate and/or fresh frozen plasma) through the same line is not recommended (may be administered simultaneously through separate IV lines)
NOTE: Do not administer the aforementioned agents simultaneously in the same IV line.

Storage Information
Lyophilized form: Store at 25°C (77°F); excursions permitted to 15° to 30°C (59° to 86°F).
Storage of Reconstituted Drug Product: Once reconstituted, hydroxocobalamin is stable for up to 6 hours at temperatures not exceeding 40°C (104°F).
Do not freeze. Any reconstituted product not used by 6 hours should be discarded.
Please see two 2.5-g vial full Prescribing information for complete instructions regarding dosing, preparation, administration, incompatibility, and storage information.

Indication
CYANOKIT® (hydroxocobalamin for injection) 5 g for intravenous infusion is indicated for the treatment of known or suspected cyanide poisoning. If clinical suspicion of cyanide poisoning is high, CYANOKIT® should be administered without delay.

Use caution in the management of patients with known anaphylactic reactions to hydroxocobalamin or cyanocobalamin. Allergic reactions may include: anaphylaxis, chest tightness, edema, urticaria, pruritus, dyspnea, rash, and angioneurotic edema. Substantial increases in blood pressure may occur following CYANOKIT® therapy. Usage may interfere with some clinical laboratory evaluations. Also, because of its deep red color, hydroxocobalamin may cause hemodialysis machines to shut down due to an erroneous detection of a "blood leak." This should be considered before hemodialysis is initiated in patients treated with hydroxocobalamin. Due to potential photosensitivity, patients should avoid direct sun until erythema resolves.

CYANOKIT® should be used during pregnancy only if the potential benefit justifies the potential risk. Safety and effectiveness of CYANOKIT® have not been established in pediatric patients. The most common adverse reactions (>5%) are transient and include chromaturia, erythema, rash (predominantly acneiform), increased blood pressure, nausea, headache, decreased lymphocyte percentage, and injection site reactions.

Please see two 2.5-g vial full prescribing information.

Contact for Additional Information

Occupational Health Nurse Adviser
Email: f.coulthard@uq.edu.au
Phone: 07 3365 4883 (ext 54883)