

Management of Organophosphate Poisoning

ICU CG-xxxx-01

1. PURPOSE & SCOPE

To provide clinical guidelines for staff working with patients affected by ingestion of organophosphates.

General Notes regarding nosocomial risk for staff involved in patient care:

- There are NO case reports of actual poisoning occurring to staff when appropriate clinical care and donning of PPE is used when providing care for patients with organophosphate (OP) poisoning.
- The hydrocarbon solvent (not the organophosphate compound) associated with OP's can cause self limiting symptoms (nausea, headache and dizziness) for staff caring for the OP poisoned patient. The hydrocarbon is commonly associated with a noxious odour resembling potent petroleum.
- All SESIAHS staff members should strictly adhere to full PPE (as per Infection Control guidelines). Organophosphates can be absorbed through latex; therefore health care workers should wear rubber (Nitrile or Butile) gloves.
- Staff should be rotated out of the clinical area (every 20-30 minutes) if they become symptomatic from noxious exposure
- No staff member who is known (or suspects) to be pregnant should be allowed to care for the patient with OP poisoning.

Patients with organophosphate poisoning may be nursed in the general ICU with adequate ventilation, providing they have been properly decontaminated by HAZMAT and/or the ED. Alternatively, patients may be nursed in the Isolation bay (3) with negative pressure in order to control the noxious odour.

2. RESPONSIBILITIES

All Nursing Staff and Medical Officers in Intensive Care

3. REFERENCES

Anderson, KN., Anderson, LE., and Glanze, WD (1998) *Mosby's Medical, Nursing and Allied Health Dictionary* 5th Ed. Mosby-Year Book, Missouri.

Little, M and Murray, L (2004) Consensus statement: Risk of nosocomial organophosphate poisoning in emergency departments. *Emergency Medicine Australia* 16: 456-458.

Roberts, M. and Aaron, CK (2007) Management of Acute Organophosphate Pesticide Poisoning *British Medical Journal* 334: 629-634.

Policy Reviews: Liverpool Health Service ICU, North Coast Area Health Service ICU and South Eastern Sydney Illawarra ICU.

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4. DEFINITIONS

Organophosphate insecticides - A group of highly toxic chemicals that are rapidly absorbed through dermal and oral routes. Organophosphorous compounds bind and inactivate the enzyme acetylcholinesterase causing a cholinergic crisis (profound muscular weakness and respiratory paralysis).

PPE – Personal Protective Equipment.

ED - Emergency Department

GRADING SEVERITY OF ORGANOPHOSPATE INGESTION

Normal serum acetylcholinesterase/ **RBC Cholinesterase** level is **8.0 – 20.0 U/L**

Mild	Moderate	Severe
Walks and talks Headache, dizzy Nausea, Vomiting Abdominal pain Sweating, salivation Rhinorrhoea	Cannot walk Soft voice Muscle twitching (fasciculations) Weakness Anxiety, restlessness Small pupils (miosis)	Unconscious, no pupillary reflex. Muscle twitching, flaccid paralysis Increased bronchial secretions Dyspnoea, crackles/ wheeze Possible convulsions Respiratory failure
Serum acetylcholinesterase enzyme (AChE) Results: 1.6 – 4.0 U/L	Serum acetylcholinesterase enzyme (AChE) Results: 0.8 – 2.0 U/L	Serum acetylcholinesterase enzyme (AChE) Results: < 0.8 U/L

5. CLINICAL GUIDELINES

5.1 ED Decontamination Management (concurrent with resuscitation and antidotal measures:

- HAZMAT may have decontaminated the patient on scene (using HAZMAT specific guidelines and procedures) prior to transferring the patient to ED.
- Further decontamination is carried out in ED. This entails removing all clothing, shoes, belts, underwear, hair accessories, jewellery and placing all in disposable contaminated and sealed waste bags.
- Contaminated leather articles should be discarded as leather absorbs the chemical and cannot effectively be cleaned.

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- ED will wash patient at least 3 times with copious amounts of soap (containing chlorhexidine and alcohol) and water, paying particular attention to hair, skin folds and underneath nail beds (as per SHN ED policy 'Management of Organophosphate Poisoning').

5.2 Additional ICU OP Management

- There is no need for isolation of patient - single negative pressure room is advisable for noxious odour only.
- All ICU staff to strictly adhere at all times to full PPE for contaminated patients.
- If the patient is incontinent of faeces, urine or vomitus a full body wash (further decontamination) will need to be repeated. This consists of heavily soaped water and paying particular attention to folds/ skin creases, body hair and finger/ toe nails.
- In the event of skin contamination for staff member – immediate vigorous washing with soap and water to the affected area is essential.
- Maintain initial concurrent and progressive life support measures as directed by the ICU Consultant and Team.
- **Airway** – Protection, prevention of aspiration, clearance of secretions and adequate ventilation (do not use neuromuscular blocking agent succinylcholine, as it may result in prolonged paralysis of hours to days). If using non- depolarising neuromuscular blocking agents, there may be delayed onset with higher dosage required to obtain effect.
- **Breathing** – There is a risk of weakness/ paralysis of respiratory muscles. Improve tissue oxygenation prior to administration of atropine – this minimises the risk of ventricular fibrillation.
- **Circulation** – BP may be high or low, provide support with cautious use of noradrenaline in the hypotensive patient (due to erratic stimulation of the sympathetic nervous system).
- **Deficits** – Seizures may occur – assess BSL, continue to treat with atropine followed by benzodiazepines. The patient may require further treatment with barbiturates. Seek toxicological advice as required.
- **Drug Therapy** – as per Appendix I

5.3 Linen and Garbage Disposal

- All linen used on the patient should be placed in contaminated waste bags, sealed and thrown into general laundry linen.
- Heavily soiled linen (faeces, urine and vomitus) should be placed in contaminated waste bags, sealed and thrown into contaminated waste bin.
- All garbage generated from direct patient care should be placed in contaminated waste bags, sealed and thrown into contaminated waste bin.

5.4 Visitors

As per ICU discretion with appropriate PPE.

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5.5 Transfer from ICU

- There is no need for isolation of the patient.
- The odour due to hydrocarbons can be managed by regular staff rotations.
- The ICU bed area is to be cleaned with dilute hypochlorite (bleach) solution and the rest of the ICU bay is to be cleaned as per 'Terminal Cleaning Policies' by domestic staff.
- Patients may be considered for transfer to the ward after cessation of drug therapies and the absence of signs and symptoms of OP.
- Serum acetylcholinesterase levels are to measure > 1700U/L, approaching the normal levels of 3500-8500U/L.
- If the patient's condition deteriorates, requiring further treatment with atropine and pralidoxime, then liaison needs to occur with the admitting team and the ICU Specialist.

6. DOCUMENTATION

All observations are to be recorded on patients' daily flow chart (MR ICU 1 2/07) and patients' medical records (MR 35).

7. COMPLIANCE

Compliance will be monitored via exception reporting through the electronic incident reporting system, IIMS™.

8. REVISION & APPROVAL HISTORY

Date	Revision No.	Author and Approval
June 98	Rev 0	
November 2008	Rev Draft Next due for review 2011	Approved Paola Sheridan – Moules NE ICU Wollongong Alan Davey-Quinn – ICU Staff Specialist Wollongong

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Appendix I

Drug Therapy

	Atropine Sulphate	Pralidoxime (PAM, Protopam)
Classification	Antimuscarinic	Cholinesterase reactivator
	Reverses the muscarinic effects of organophosphate poisoning.	Reverses the nicotinic effects of organophosphate poisoning.
Pharmacokinetics	Readily absorbed from all parenteral sites of administration. The drug is distributed to all parts of the body, including the brain and central nervous system. About two-thirds of atropine is metabolised by the liver and the remainder is excreted unchanged by the kidney.	Best absorbed by the parental route. The drug does not bind to plasma proteins and does not cross the blood brain barrier. The drug is partially metabolised by the liver and both the drug and metabolites are excreted by the kidney.
Side Effects/ Adverse Reactions	Dilated pupils, dry red skin, confusion, tachycardia, fever, ileus and urinary retention.	Rare with standard dosing regimes. Intramuscular injection results in pain at the injection site. Rapid intravenous (IV) injection causes hypertension (transient and dose dependant), tachycardia, laryngospasm, muscle rigidity and neuromuscular blockage. Pralidoxime can accentuate atropine toxicity.

Dosages for Drug Therapy

ATROPINE – completely blocks the effects of acetylcholine.

- 1-2mg IV in moderate poisoning; 2-5mg IV in severe poisoning or as an infusion at 10-20mg/hour.
- Continue stat doses every 10-30 minutes until muscarinic signs (sweating, salivation, and bronchorrhoea) subside.

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- Infusion: 60mg atropine in a 50ml syringe (50 x 1.2mg ampoules)
- Titrate from 100 micrograms/hour (0.1 ml/hour) to 10-20mg (8.5 to 17ml/hour)
- Nebulised atropine may improve respiratory distress and oxygenation by decreasing bronchial secretions, however, where ingestion results in hydrocarbon aspiration, an ARDS picture occurs (refractory pulmonary oedema and poor oxygenation)
- Tachycardia is not a contra-indication to therapy (it may be secondary to hypoxia or sympathetic stimulation).
- Pupillary dilation is not a sign of adequate therapy.
- Atropine is ineffective against nicotinic effects (thus respiratory depression and muscle weakness remain in the presence of atropine).

PRALIDOXIME – regenerates acetylcholinesterase and acts synergistically with atropine.

- Before administration, ensure blood specimen (heparinised tube) is taken for acetylcholinesterase analysis.
- Rapid administration may result in tachycardia, laryngeal spasm, muscle rigidity and transient neuromuscular blockade.
- Pralidoxime is used in moderate/severe poisoning where respiratory function ceases or seizure/coma occurs.
- Delayed presentation of a symptomatic patient is not a contraindication to the use of pralidoxime.
- Initial doses of 2 grams IV over 30 minutes.
- In mild to moderate poisoning, administer 1 gram IV every 8 hours.
- In severe poisoning the infusion rate is at 500mg/hour : 1 gram in 40mls (total of 50 mls) at 25mg/hour (20mls/hour).
- Infusion is ceased based upon clinical testing and mixed plasma cholinesterase test.
- Pralidoxime is metabolised by the liver and excreted by the kidneys.

FRUSIMIDE – is considered for persistent pulmonary oedema after full atropinization.

ACTIVATED CHARCOAL – is occasionally administered in the ED as the first dose. Nil further administrations are required in the ICU.