SIMulatED

Royal Darwin Hospital Emergency Department

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# Scenario Run Sheet: Toxicology: Carbamate + methanol

## Scenario Overview

**Estimated Scenario Run Time:**  15-20 mins

**Estimated Guided Reflection Time:** 30 mins

**Target Group:** ED Registrars and Nurses, SACU and Paediatric registrars

**Brief Summary:** 19 yo with severe carbamate and methanol poisoning, intubated prehospital, requiring early initiation of antidotes and supportive therapy.

## Learning Objectives

**General**

Resus team work

**Scenario Specific**

Structured approach to life-threatening intoxication with carbamates and methanol, including resuscitation, risk assessment, supportive care and monitoring, investigations, antidotes, decontamination, enhanced elimination and disposition.

Local health service limitations regarding antidote availability

## Equipment Checklist

**Equipment**

Odour of organophosphate in room . Masks and long blue plastic gowns. Plastic bags for pt clothes. Garlic

**Medications and Fluids**

Giving set, 0.9% saline, 5% dextrose, atropine, pralidoxime, adrenaline, noradrenaline, Nabicarb, midazolam/diazepam, ethanol (vodka bottle), folinic acid, thiamine, NGT and IVC drainage systems

**Documents and Forms**

ED nursing chart, intubation checklist, Where’s Wally checklist, Lannate chemical info sheet

**Diagnostics Available**

CXR – intubated, patchy atelectasis

VBG – severe HAGMA /HOG

ECG -

## Scenario Preparation/Later Parameters

**Initial Later**

GCS **3T** RR 30BVM P 70 BP 70/50 GCS **3T** RR 30-40 HR 120

Sats 90% F 1(wet) T 37.2 BSL gas SaO2 98% (dry) BP 90/60 T 36.2

Pupils 4mm

**Mannequin Features**

Adult male, clothing with garlic smell.

## Participants

**Staff Actors**

ED Registrars x3 Mother /Father Radiographer

Nurses x3ED, ED /ICU / Tox Consultant available by phone

ICU registrar SJA for handover

**Instructor Roles**

- Provide the team with clinical signs, VBG, CXR

## Candidate Instructions/Triage Information

You are informed by the nurse TL that a male in his 20’s is arriving in 10 mins post Suspected organophosphate overdose (Lannate-L). Found in shed having a seizure, CPR commenced 20 minutes with ROSC. Given multiple doses of atropine. Current vitals: HR 90, BP 100/70, Intubated by ICP SaO2 95% 100%

## Patient Instructions

**Medical History (from SJA)**: 19 yo Truc. Found approximately 90 minutes ago unresponsive and fitting in the garden shed after ingesting unknown quantity Lannate insecticide. Open drum nearby, foul-smelling vomitus on floor. Family attempted chest compression but no ventilations given until SJA arrived. Crew on scene 60 minutes ago. Patient in cardiac arrest. Asystole on monitor. CPR commenced manually (not Austopulse due to clothing contamination), intubated by ICP, given 3 doses of adrenaline, 4 doses atropine 500mg with ROSC. PH szhizoaffective disorder, meds: olanzapine, zuclopenthixol depot ? missed last dose

**Social:** Vietnamese born, DSP, lives with parents and 2 younger siblings, market gardeners. Very little English spoken by any of the family present.

## Proposed Scenario Progression

* Requests FACEM/ICU attendance early (25 minute ETA for FACEM). Considers calling in Vietnamese interpreter. Performs web search for Lannate-L. Identifies carbamate and methanol poisoning.
* Handover from SJA, initiation of primary survey, specifically looking for organophosphate toxidrome
* Continuation of resuscitation and performs risk assessment (Synthesises additional information on Lannate composition, identifying both **carbamate and methanol toxicity**, considers other co-ingestion
* Early ECG and VBG recognising HAGMA/HOG.
* Team handed Lannate info sheet at 5 min mark (internet)
* Detects recurrence of cholinergic state with bradycardia, miosis and respiratory secretions – delivers appropriate doses of atropine.
* Consults Tox service
* Refers to ICU
* Sends appropriate assays (coingestant drug levels, cholinesterase activities
* Patient develops shock, bradycardia and asystolic arrest; appropriate ALS leads toROSC after 2 cycles. Ongoing shock requires fluids and inotropes (adrenaline)
* Commences specific antidotes for methanol poisoning(Ethanol, Thiamine, folate, MgSO4, piridoxine; gives Na bicarbonate; advised not to give pralidoxime
* Recruits NRC to assist with locating antidotes
* Inserts OGT, arterial line and CVC
* Patient remains inotrope and atropine dependent and is transferred to ICU

## Debriefing/Guided Reflection Overview

**General Opening Questions**

* How was the scenario? Has anyone managed a situation like this before?

**Scenario Specific Questions**

* What preparations did you make after notification? What were you concerned about?
* What changed after you became aware of the composition of the insecticide, including its diluent?
* How did you prioritise your drug therapy? What difficulties did the team face in delivering these therapies?
* The patient arrested soon after arrival: What did you think caused this and talk us through your management

**General Wrap-Up Questions**

* What did you find most beneficial about this scenario?
* What was the most challenging point in this scenario?
* What would you do differently next time?

IDEAL Management of this scenario (**Carbamate + Methanol**): Tox handbook

**Preparation + risk assessment**

Call in senior staff,

\*Prepare space: ideally negative pressure ventilated resus room

\*Prepare resus teams: may need shifts given nausea from odour (reassure that ingestion is required for poisoning); include PPE (to protect scrubs) and dedicated staff to remove/bag pt clothes and sponge skin with soapy water (odour control)

\*Prepare drugs and antidotes: ALS drugs, seizure (BZD), large supply atropine ? ICU/pharmacy to assist, ? pralidoxime (not for carbamate); Methanol:

Seek information:

-POISINZ internet/phone

-Lannate composition including diluent

-Patient record

Call in interpreter

**Reception: Resuscitation + early Antidote**

Coordination of primary survey and handover

Early intubation (in not already done)

Manage cardiac arrest as usual with addition of **atropine** 1mg boluses IV, doubling every 2 mins until ROSC (if arrested) or **drying of secretions**. May need up to 100mg atropine. MUSCARINIC block only (DUMBBELS: ANS, not NMJ). Fluid boluses for hypotension (high fluid loss). Supportive care with inotropes: art line and CVC. Close cardiac and BP monitoring (art line) to assess recurrence of chlolinergic excess

Methanol Antidotes:

No fomepizole in Aus (comp ADH antag)

Block alcohol dehydrogenase with ethanol until cleared by HD (no LD if already etoh intox):

-IV (LD 8ml/kg 10% then 1-2ml/Kg/h)

-oral (LD 1.8mL/kg 43% vodka; MD 0.3ml/kg/hr) for BAL 0.1-0.15%

Cofactors:

Folinic acid 2mg/Kg IV q6h (enhance formate elimination)

Thiamine 300mg tds for Wernicke prevention

**Supportive care and monitoring**

OP:Ventilator strategy to manage hypoxia from bronchorrhoea/chemical pneumonitis (aspiration): manage surges in secretions/wheeze/miosis/sweating/bradycardia/hypotension with increased atropine and intermittent suctioning.

Methanol: hyperventilation to manage metabolic acidosis. Bicarbonate 1-2mmol/KG pending HD. Maintain pH >7.3 (acidosis facilitates formate inhibition of cytochrome oxidase)

Arterial line, CVC

Manage seizures/delerium with BZD, seek and treat hypoglycaemia; maintain normothe rmia

NGT free suction: output

IDC and fluid balance

**Staff management**

Early removal of contaminated clothing/skin wash

Rotate staff frequently

**Investigations**

BSL

ECG

Paracetamol

4h EUC

OP:

\*Cholinesterase activities: see toxidrome when activity <25%

**Plasma:** confirms exposure; falls fast and normal within 4-6 weeks

**RBC:**correlates with severity and adequacy of oxime therapy. Normal within 120 days (RBC life)

**Mixed plasma**: ? better marker adequacy of oxime therapy (not validated). Pt blood mixed 50:50 with lab worker’s blood: If Activity(mixed)< mean activity of two unmixed samples, then unbound OP present thus increase oxime dose.

Methanol: >25mls 40% /30 mls 100% fatal

2H ethanol level

Hourly VBG, BSL (bicarb levels surrogate for serum formic acid)

**Serial VBG**

(HAG/OGMA + hypoxia, Osm, lactate, blood gases)

Ethanol levels (intox and therapeutic level)

Methanol level (academic)

EUC

**GI Deontamination X “confers no benefit” (Murray)**

**Enhanced elimination**

OP: X

Methanol: HD

**Disposition**

ICU: manx acute toxicity both agents, OP intermediate syndrome – paralysis 2-4 days

Psychiatry

OPD followup for delayed neuropathy, chronic OP neuropsychiatric disorder/underlying psych dx