Acute pesticide poisoning in South Africa:

Clinical recognition, diagnosis & treatment

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Pesticide & Agricultural Stock Remedies Poisoning Webinar

22 January 2026

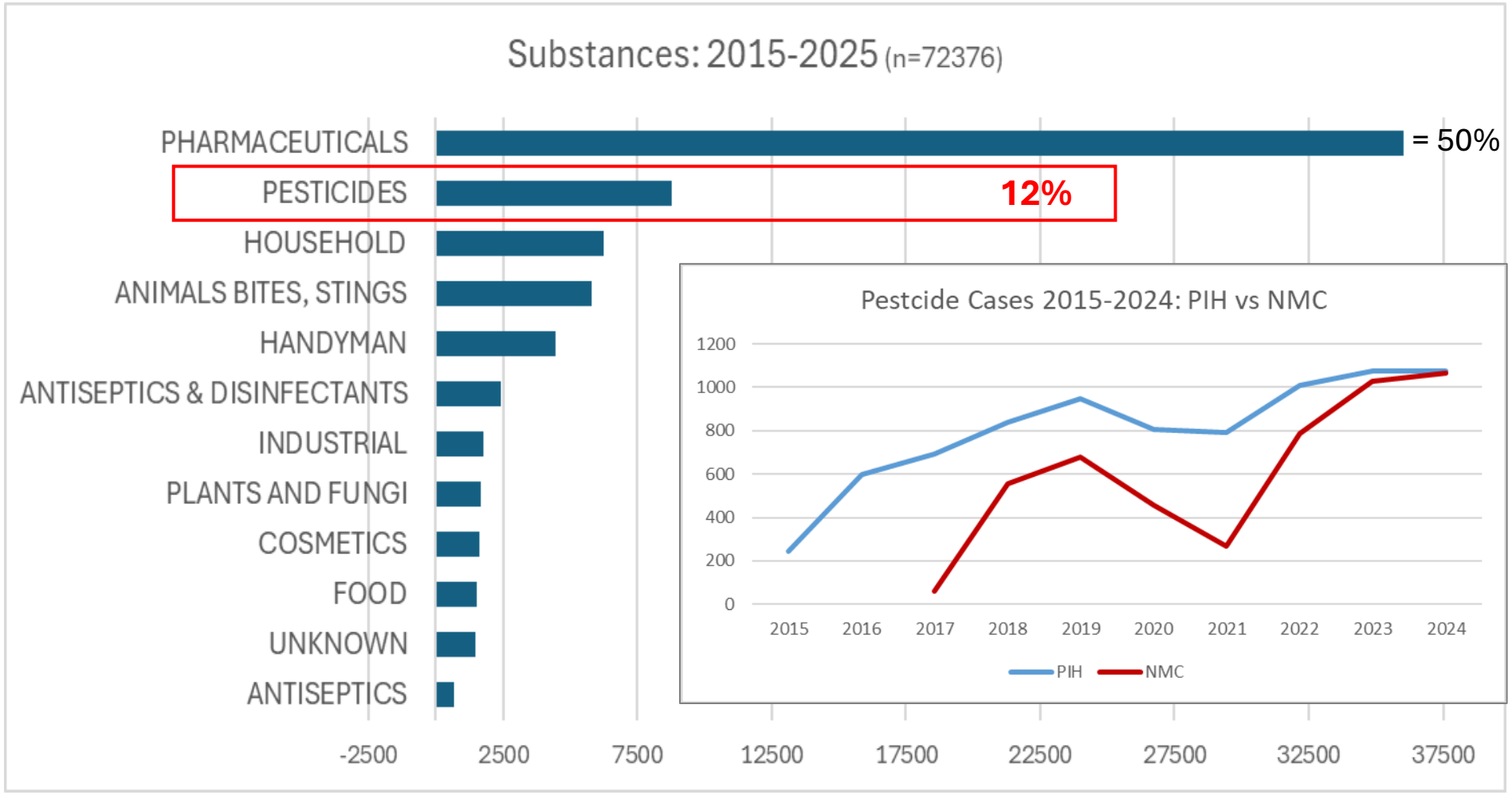
No conflicts of interest

HREC R014/2014
HREC 699/2025

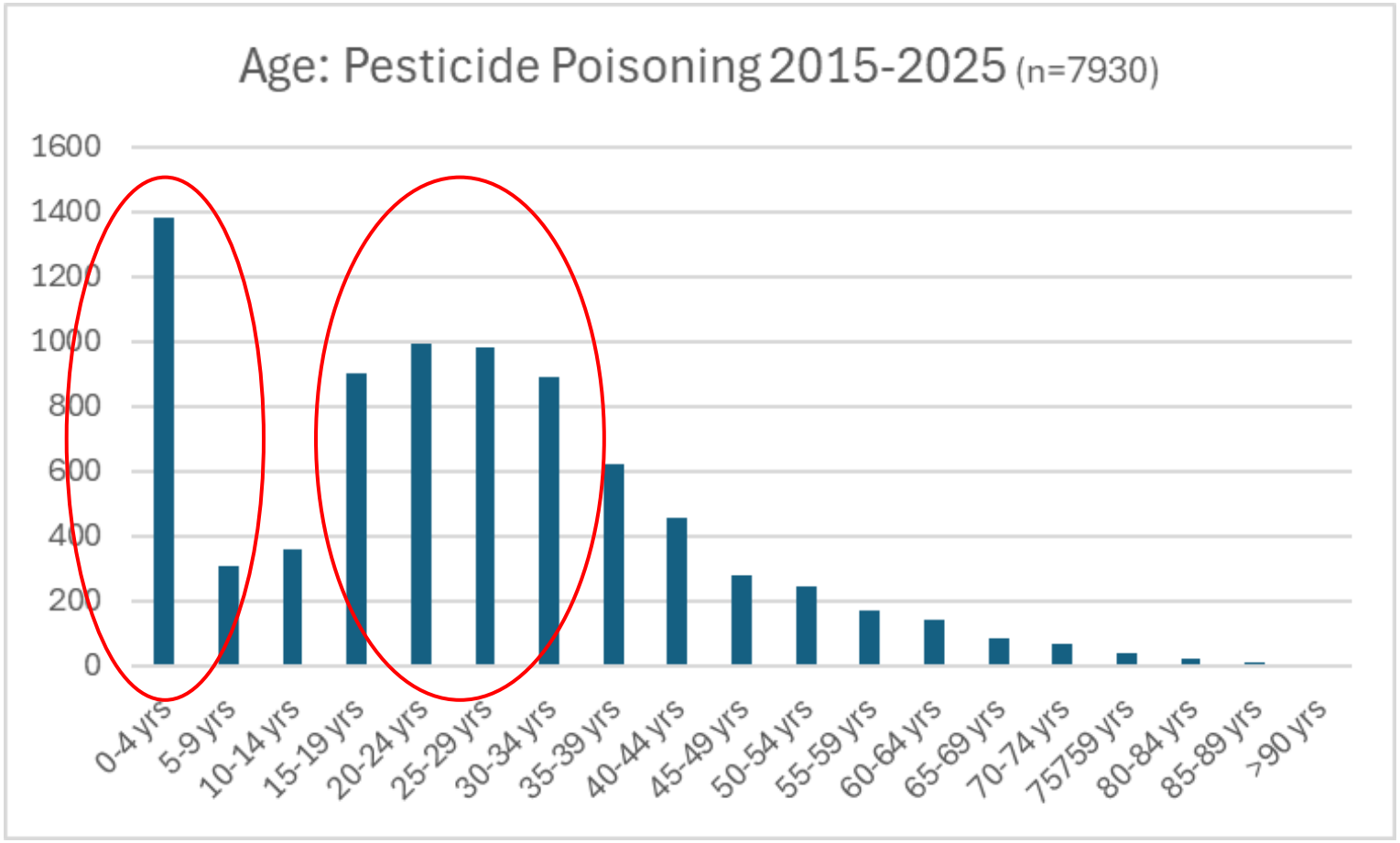
Outline

- South African landscape (pesticide poisoning)
- Clinical presentation & diagnosis
- Approach to treatment
- Resources

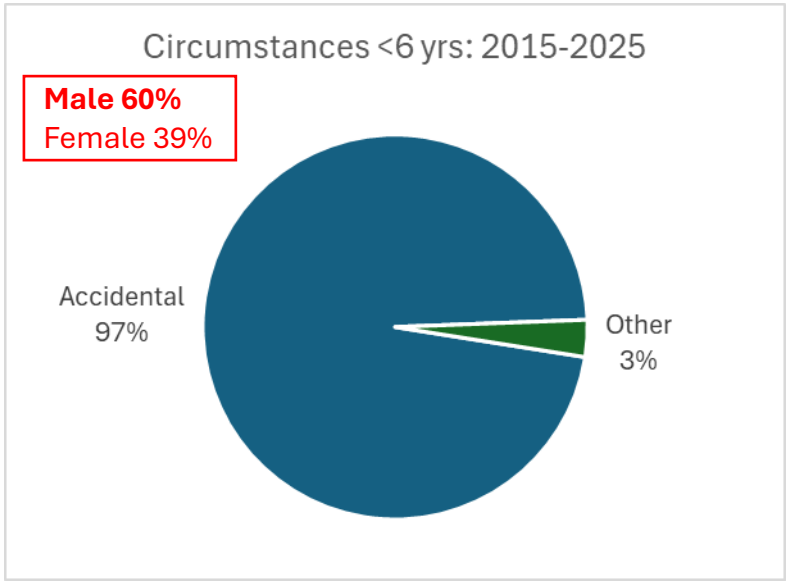
Poison Information Helpline – Pesticides data



Children, Teens & Young adults

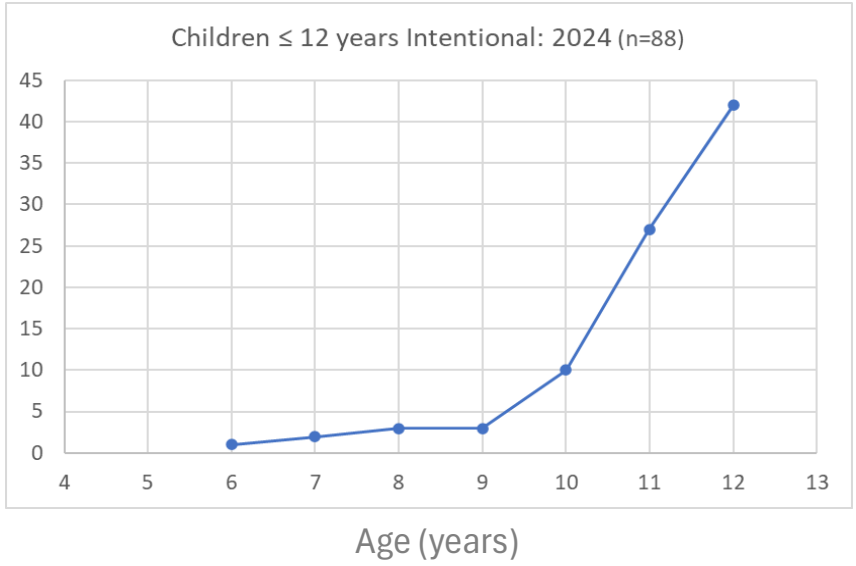


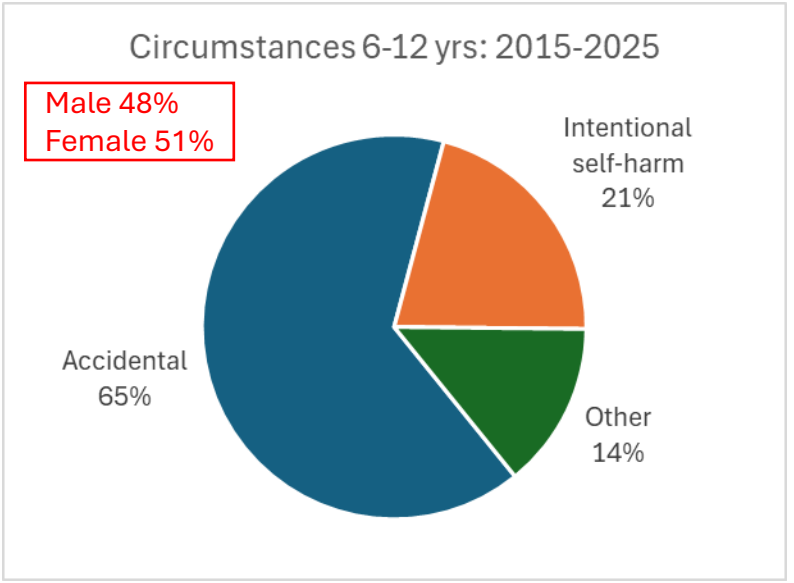
- Under 5 = 17%
- Teens = 16%
  (10-19 yrs)
- Young adults = 36%
  (20-35 yrs)

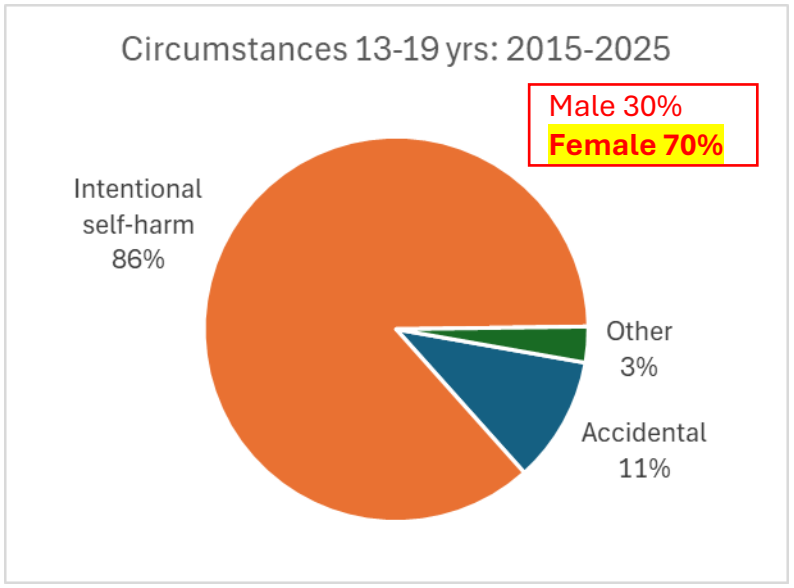


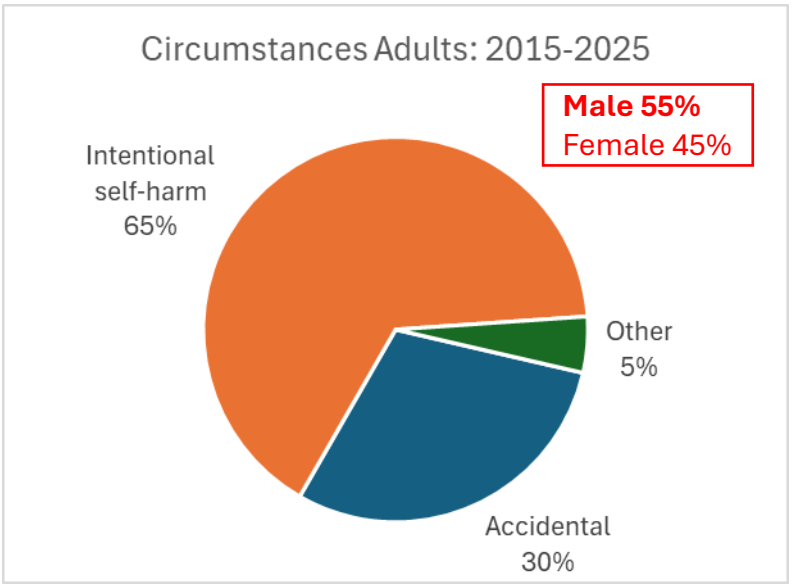
Intention

- SELF-HARM
  - Teenage girls
  - Young adults
- Stress
- Easy access (street pesticides)









Health impacts & outcome

- Severity of clinical illness
  - 15% significant morbidity overall
    - Organophosphates 43%
    - Phosphides 36%
    - Paraquat 42%
    - Formamidines (amitraz) 56%

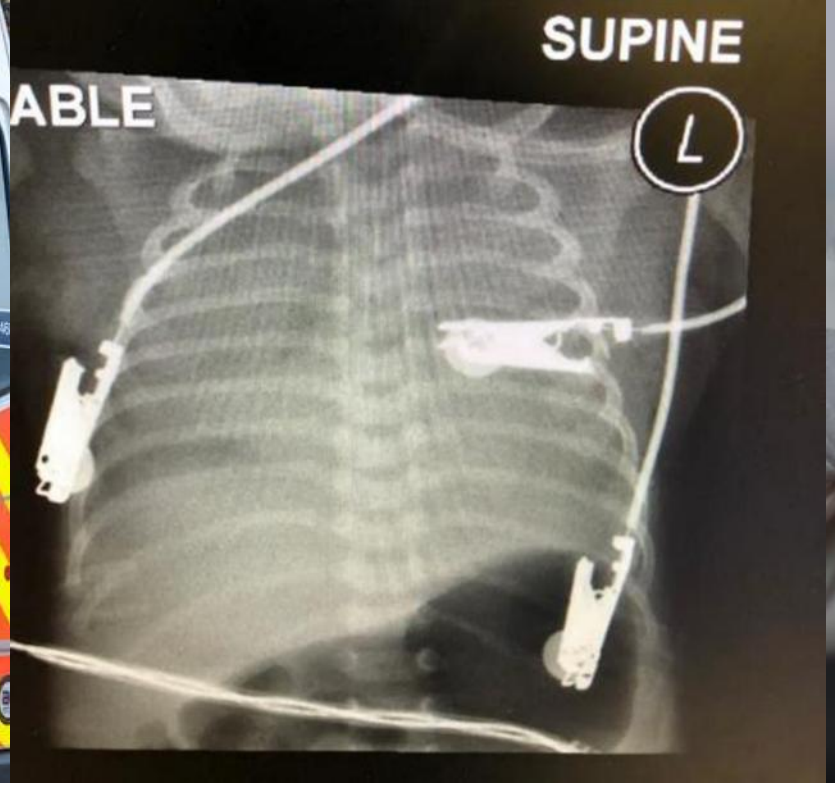
DEATHS: 2015-2025	No.
Paraquats	15
Organophosphates	10
Phosphides (aluminium)	6
Formamidine Insecticides (amitraz)	2
Other	2
TOTAL	**35**

- Pesticide deaths - NMC

NMC Data			
Year	Notifications	Deaths	CFR
2017	60	3	5,0
2018	556	46	8,3
2019	677	41	6,1
2020	456	24	5,3
2021	267	30	11,2
2022	788	102	12,9
2023	1028	88	8,6
2024	1064	100	9,4
2025	694	100	14,4

Pesticide poisoning – types: 2015-2025 (n=8766)

Pesticide	No.	%
Unknown	2078	23.7
Pyrethroids	1176	13.4
Carbamates	1047	11.9
Organophosphates	990	11.3
Coumarin rodenticides	751	8.6
Amitraz	639	7.3
Glyphosate	414	4.7
Paraquat	230	2.6
Phosphides	182	2.1
Fipronil	162	1.8



Clinical Presentation, Diagnosis & Treatment

Poisoning with an “Unknown” Pesticide

1. Take a good history
2. Examine the patient carefully
   - CHOLINERGIC TOXIDROME
   - Anticoagulant Toxidrome
3. Supportive care
   - ABCDE
   - Investigations
4. Reduce absorption
   - Skin & Gut decontamination
5. Limit effect
   - Antidotes – atropine, vitamin K

NOTIFY!! … a Category 1 NMC

KEY POINTS

- Pesticide exposure
  = history
- Health effects
  = symptoms/signs
- Cause-effect
  = time-frame appropriate

AGRICULTURAL OR STOCK REMEDY POISONING

Disease epidemiology	Clinical case definition (Suspected case)	Probable case definition	Confirmed case definition
A pesticide (e.g. an agricultural or stock remedy) is any chemical substance, or mixture of substances, intended to kill, repel, or control forms of plant or animal life considered to be pests, or to regulate plant growth. Pesticides include herbicides, insecticides, fungicides, rodenticides, repellents. Pesticides are potentially toxic to humans and the environment, and can have both acute and chronic health effects, depending on the quantity and ways in which a person is exposed. Some pesticides can remain in soil and water for years. The toxicity of a pesticide depends on its function, formulation and the route of exposure (i.e. ingestion, inhalation, or direct contact through the skin or eyes). Pesticide poisoning can be classified as occupational, if exposure occurs while at work, or non-occupational, which includes exposure at home as well as all cases involving suicide or self-harming behaviour.	**Must satisfy ONE criterion in EACH category listed below:** 1. **Pesticide exposure** a. Report of acute pesticide exposure, from a patient or witness 2. **Health effects** a. Health care provider documenting ≥ 2 new post-exposure symptoms 3. **Cause-effect** relationship The health effects must: a. not be associated with any other likely explanation AND b. occur within a reasonable time period after exposure	**Must satisfy ONE criterion in EACH category listed below:** 1. **Pesticide exposure** a. If criterion as for a Suspected case, must have Health effects criterion as for Confirmed case OR b. If criterion as for a Confirmed case, may have Health effects criterion as for Suspected case 2. **Health effects** a. If criterion as for a Suspected case, must have Pesticide exposure criterion as for Confirmed case OR b. If criterion as for a Confirmed case, may have Pesticide exposure criterion as for Suspected case 3. **Cause-effect relationship** The health effects must: a. be characteristic of the pesticide AND b. occur within a reasonable time period after exposure	**Must satisfy ONE criterion in EACH category listed below:** 1. **Pesticide exposure** a. Observation of residue/odour by health care provider OR b. Clinical response to treatment or antidote (e.g. atropine) OR clinical description by a health care provider of ≥ 2 post-exposure health effects (at least 1 of which is a sign) characteristic for the pesticide OR c. Laboratory test demonstrating physiologic response to pesticide (e.g. prolonged clotting or pseudocholinesterase level below normal laboratory range) 2. **Health effects** a. Health care provider documenting ≥ 2 characteristic signs OR b. Health care provider documenting ≥ 3 new post-exposure characteristic symptoms OR c. Autopsy evidence of pesticide poisoning 3. **Cause-effect relationship** The health effects must: a. be characteristic of the pesticide AND b. occur within a reasonable time period after exposure

Organophosphates

(children; street pesticide/poverty & pests)

- *2-year-9-month-old girl*
- *Cockroach killer*
  - *dichlorvos, chlorpyrifos & trichlorfon*
- *ICU – ventilated 4 days*
- *Nervous system effects developed 6 days later…*
  - *extreme agitation*
  - *strange movements*
  - *unable to speak*
  - *recovered 10 days later*

FORENSIC TOXICOLOGY UNIT

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PRELIMINARY SCREENING REPORT

Results are preliminary and subject to confirmation. Subsequent results may affect the final report.

Lab ID:	**TX24-0185**	**Case ID:**	**178589958** *(Requestor supplied)*
Date Collected:	2024/01/29 *(Requestor supplied)*	**Requestor:**	Dr. C Stephen
Date Received:	2024/02/02	**Seal Number:**	N/A

Results:

Analyte	Exhibit
Chlorpyrifos	Detected
Dichlorvos	Detected
Trichlorfon	Detected

“Street rodenticides”

Cholinergic toxidrome

- Muscarinic Effects (SLUDGE/BBB - "Killer Bs")

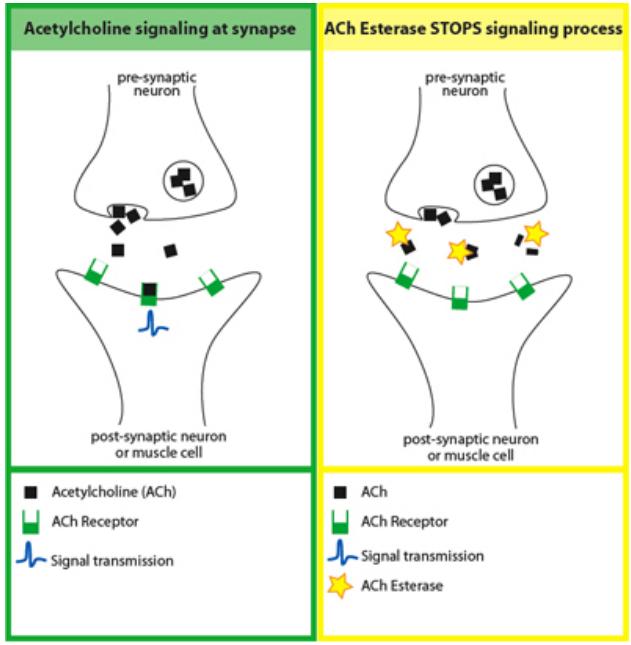
  salivation, lacrimation, urination, diarrhoea, vomiting, bronchorrhoea, bronchospasm, bradycardia, sweating, pinpoint pupils, hypotension

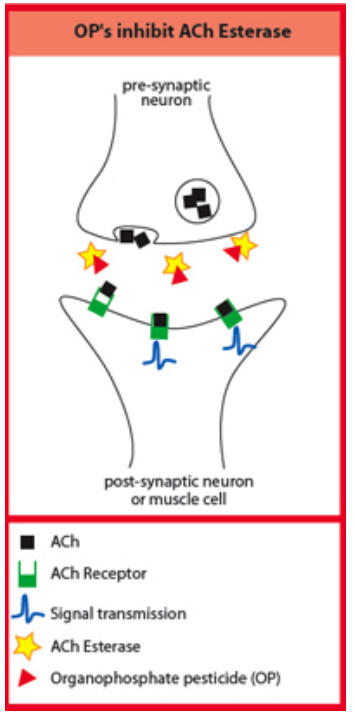
- Nicotinic Effects

  muscle fasciculations, muscle weakness/paralysis (→respiratory failure), tachycardia, hypertension

- CNS effects

  anxiety, confusion, seizures, coma, respiratory depression





Organophosphates: Diagnosis & Treatment

- ABCDE
  - suction and oxygen
  - avoid suxamethonium or mivacurium (prolonged paralysis)
  - benzodiazpines for agitation, seizures

- Atropine
  - 0.05mg/kg, then double dose every 5 mins → secretions clear
  - start infusion: 10-20% total bolus dose/hr
  - titrate infusion carefully according to patient response

- Pseudocholinesterase level = very low (< 1000 IU/L)

Amitraz… “cattle dip”

- Used as a tick dip for cattle, sheep, pigs, dogs
  - liquid formulations - solvents e.g. xylene, petroleum distillates
- Clinical Features
  - rapid onset drowsiness → coma
  - respiratory depression → acidosis
  - hypothermia, hypotension & bradycardia
  - pinpoint pupils
  - NO secretions
  - NO fasciculations

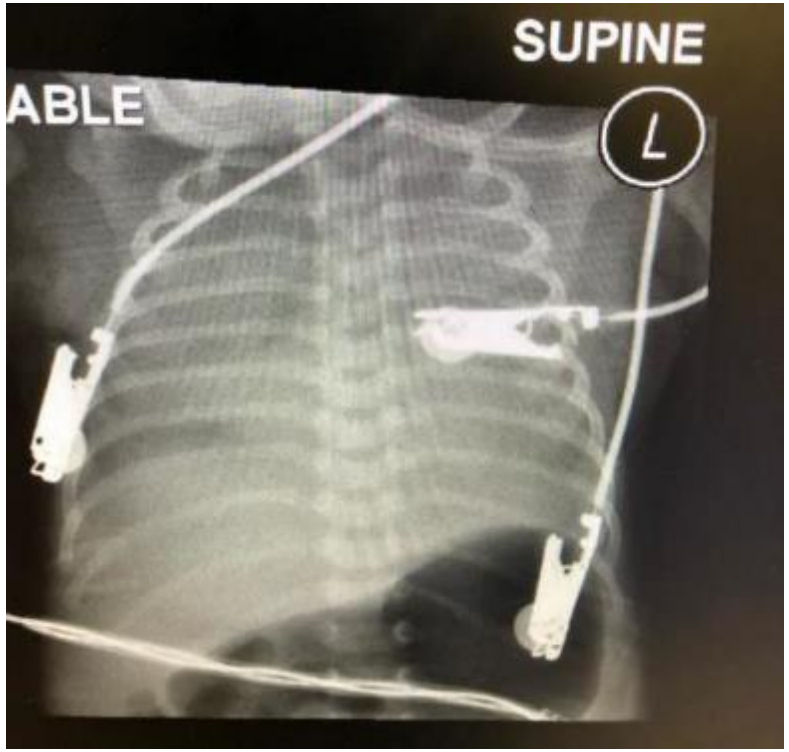
can be confused with OPP…

- Treatment
  - primarily symptomatic and supportive
  - Atropine ONLY if severe bradycardia

Phosphides

(children; regulation failure)

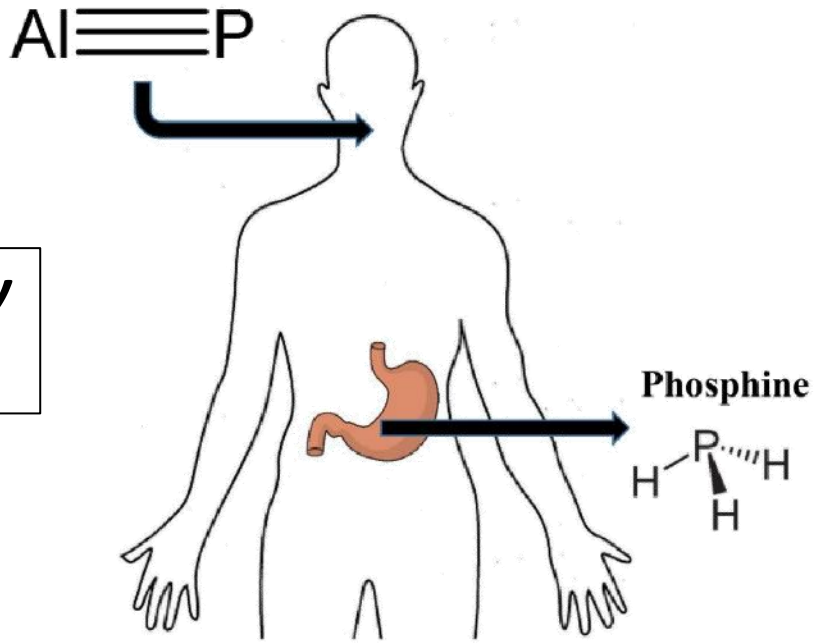
- Family of 5 presented to hospital – newborn baby
- GIT symptoms: vomiting, dizziness, diarrhoea
- Baby suddenly collapsed → ventilated → died



Phosphides: Clinical features

- Local corrosive effects
  - oesophagitis, gastritis, haematemesis
- Inhalation
  - local irritant effects: cough, eye, skin
  - systemic effects…
- Systemic effects
  - nausea, vomiting
  - chest and abdominal pain
  - anxious and agitated
  - circulatory failure, arrhythmias
  - pulmonary oedema
  - metabolic acidosis & AKI; ↓potassium; ↓glucose
  - hepatic necrosis, DIC

"Profound circulatory collapse…"

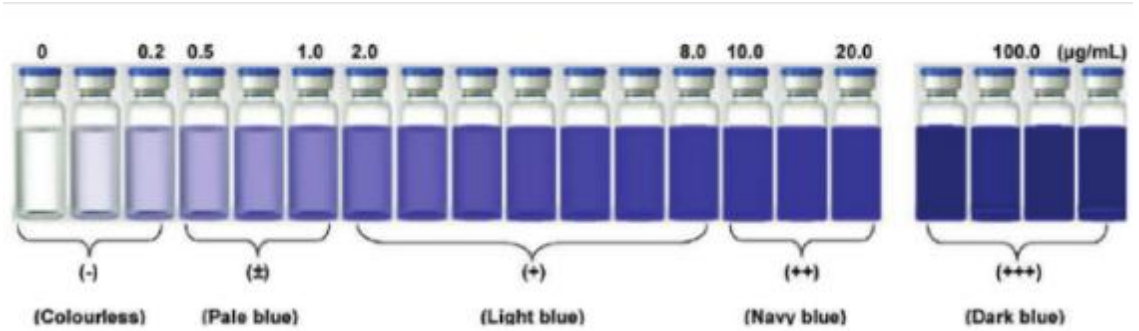


https://www.sciencedirect.com/science/article/pii/S2214750018305328

Paraquat

(suicide, highly toxic)

- *42 yr old man drank "weedkiller"*
- *Clinic discharged him after 2 days as "well"*
- *Presented hospital 2 days later*
  - *unable to breathe (lung fibrosis)*
  - *jaundice (liver failure)*
  - *kidney failure*
  - *oral ulcerations*
- *Demised 2 hours later*



Representative qualitative urinary test for paraquat. Correlation between the paraquat concentration (μ g/ml) and the intensity of the blue color change.

Treatment options = few

- AC, haemoperfusion, anti-oxidants, cyclophosphamide, steroids, NAC, desferrioxamine… none have been shown to conclusively alter outcome

Anti-coagulant rodenticides: Clinical features

- **Asymptomatic**
  - most children as amount ingested so small (<1mg)

- **Coagulopathy**
  - large ingestions
  - 1-3 days post-exposure
  - spontaneous bleeding
    - skin (bruising)
    - musculoskeletal
    - respiratory (epistaxis, gums)
    - renal (haematuria)
    - GIT
    - CNS (haemorrhage can be life threatening)
    - eyes

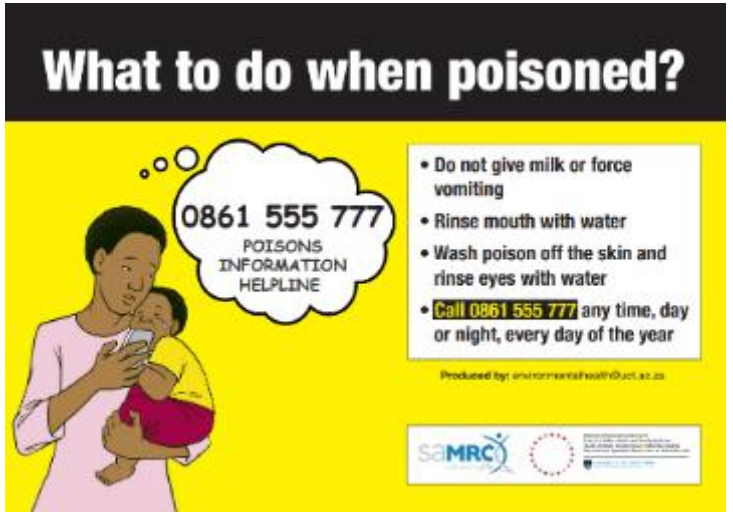
Anti-coagulant rodenticides: Treatment

- Home observation = children, small exposure & unintentional

- Admission = intentional; large exposure; symptomatic
  - **Reduce absorption**: AC within 1 hour
  - **Monitor INR:** after 36-48 hrs (or admission & 36 hrs if on anticoagulants
    - If INR < 4, no further Rx
    - If Rx required (see below), monitor INR for 2 weeks or more

- Vitamin K (phytomenadione): IV (faster, more s/e); oral recommended
  - If NO bleeding and INR > 4 : Vit K 10mg stat
  - If ACTIVE bleeding:
    - Clotting factors (II, IV, IX, X) OR FFP,
    - AND Vit K
  - If on anticoagulant Rx
    - Stop Rx and restart once INR <5
    - Vit K if INR > 8
  - Vit K may be required for 1-2 months (depends on INR monitoring)

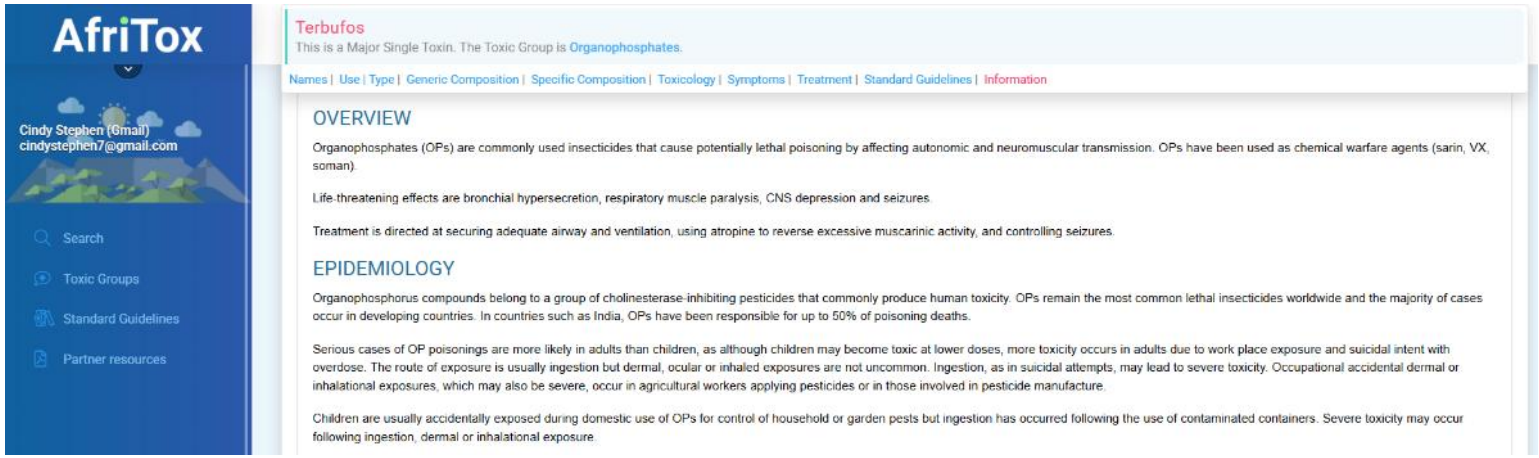
Resources



- Poison Information Helpline **0861 555 777**
- STGs & EML https://www.health.gov.za/nhi-edp-stgs-eml/

Standard Treatment Guidelines and Essential Medicines List (STGs and EML)

- AfriTox https://www.afritox.co.za/



Key Messages – Pesticide Poisoning

- Symptomatic and supportive treatment is the mainstay of care
- Pesticide poisonings result in severe morbidity and even mortality
- Category 1 Notifiable Medical Condition
- Resources
  - Poisons Information Helpline 0861 555 777
  - NDoH STG & EML
  - AfriTox

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Division of the National Health Laboratory Service

AfriTox

Thank you

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Poison Information Helpline 0861 555 777

AfriTox