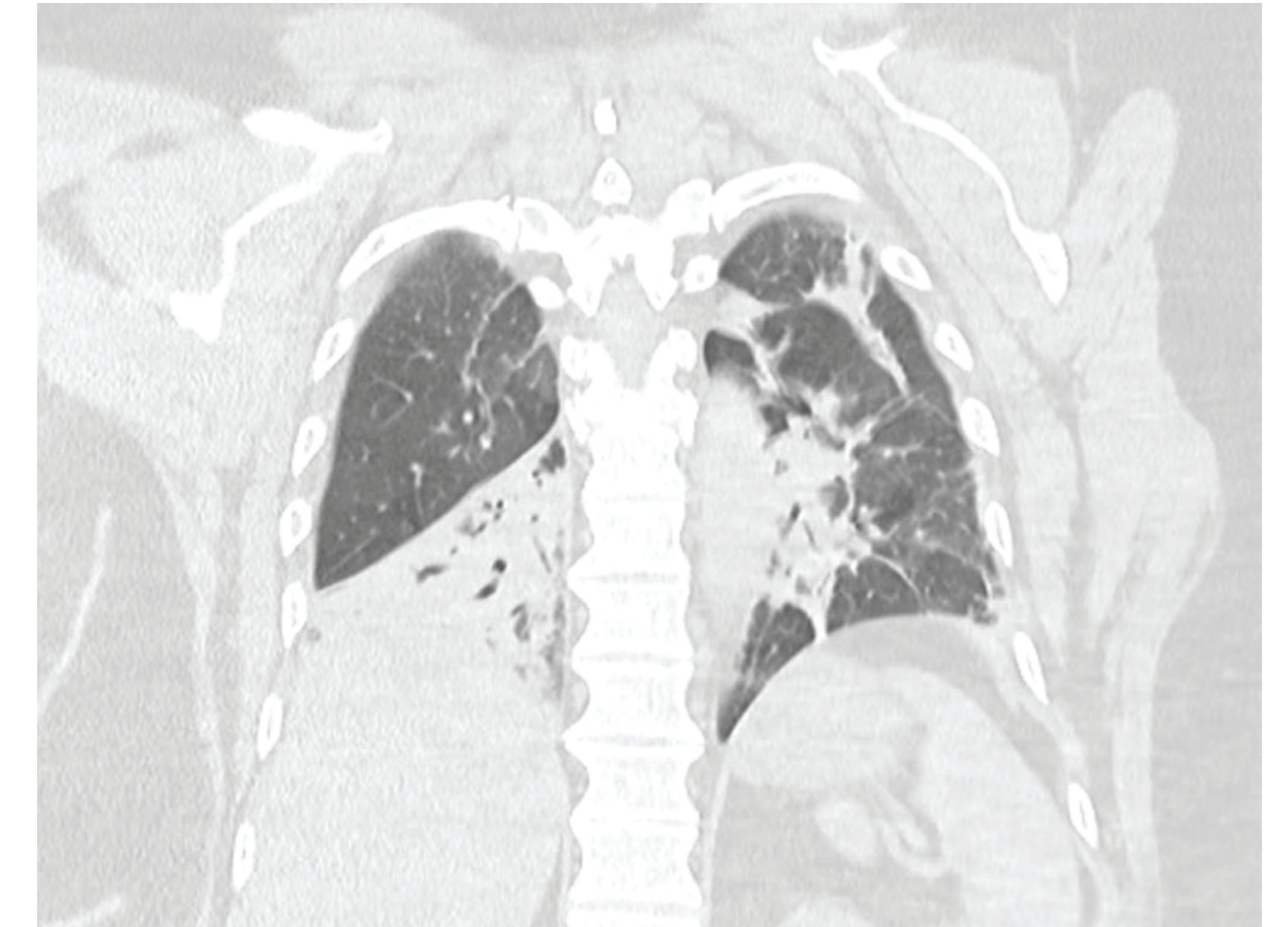
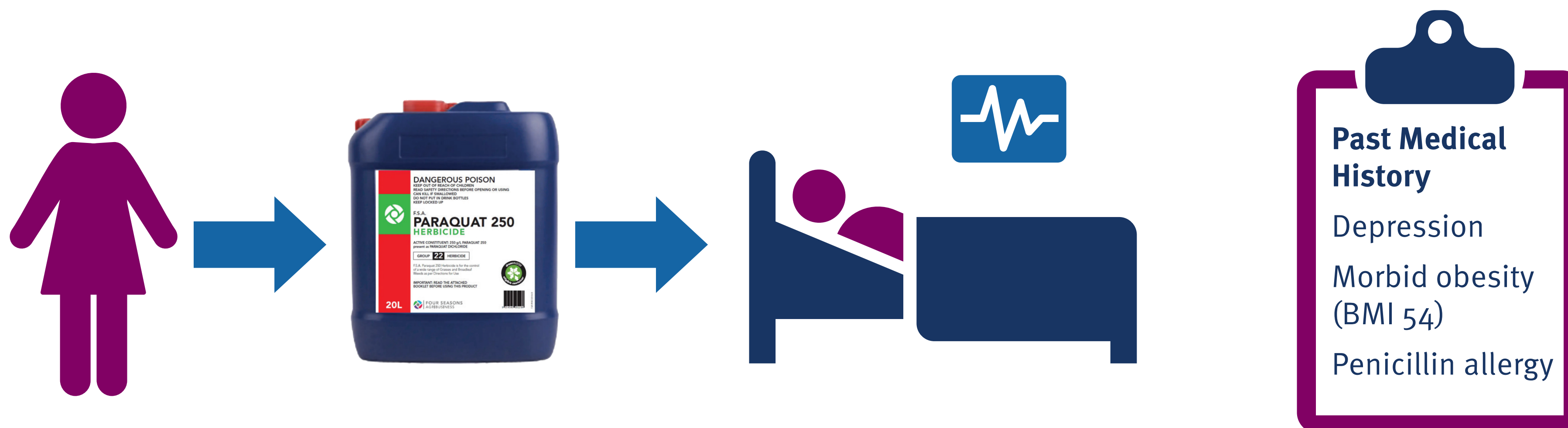


Lethal Liquids: A Case Report of Paraquat Poisoning

Angela Faint and Jordyn Bloxson
Rockhampton Hospital Pharmacy Department, Rockhampton, Queensland, Australia



A CT chest scan identified volume loss and consolidation in both lung lower lobes suggestive of an aspiration event.

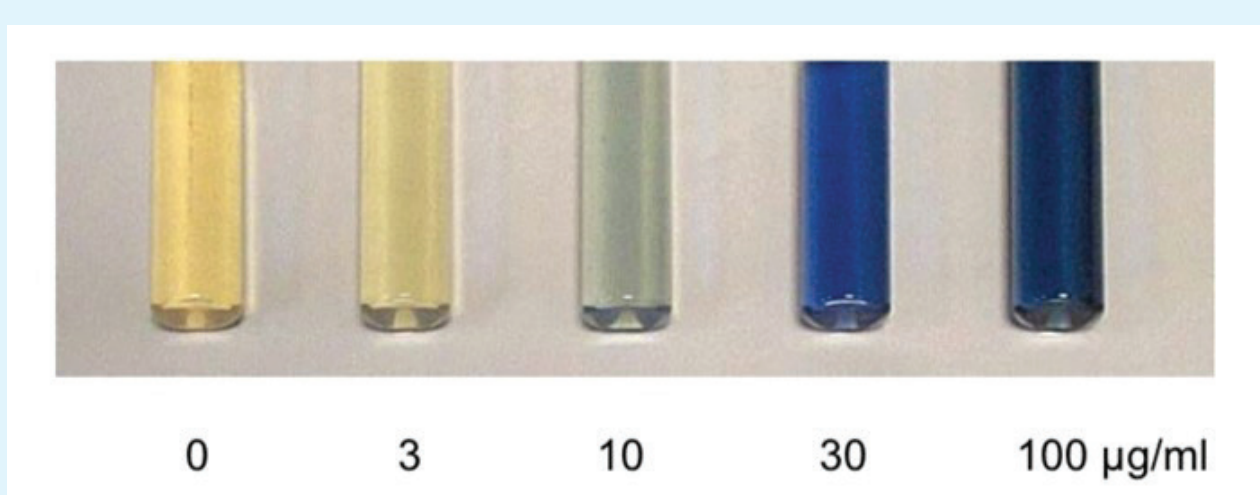
A 49-year-old female was admitted to a regional ICU following an intentional overdose. The patient was found roadside, with an altered level of consciousness in a pool of black vomitus. A herbicide container which was labelled to contain paraquat was found in her vehicle.



What do we know about Paraquat poisoning?

Paraquat is a highly toxic herbicide that, when ingested can lead to multiorgan failure and death, likely due to an acute inflammatory reaction. On ingestion, it is actively taken up against a concentration gradient into lung tissue leading to pneumonitis and fibrosis. It also causes renal and liver injury.¹

About 90% of the absorbed paraquat is excreted unchanged in the urine within 12–24 hours of ingestion, which allows qualitative and semi-quantitative detection of paraquat in urine using a sodium dithionite test (SDT).¹ The SDT can detect paraquat up to a concentrations of 1microg/mL in a clear urine sample.² Patients with urine paraquat concentrations of more than 1mg/L had a high probability of death.³



The test kit involves adding urine to sodium bicarbonate (Sachet A) then adding sodium dithionite (Sachet B). The test is positive for paraquat exposure if the solution changes to blue or greenish grey. The degree of colour change has been used in a semiquantitative way to predict toxicity. Ready access and availability of this test is important as is education of nursing and pharmacy staff on its availability and use.



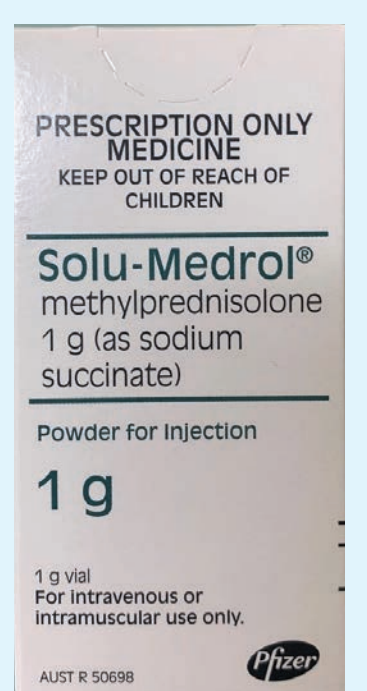
What do we know about treating Paraquat poisoning?

Given the high fatality rate with intentional ingestions, there are two competing philosophies that drive management decisions - the first is that the outcome is dire, and no treatments are likely to be effective while the second is that no treatments are likely to be worse than the disease.¹ There are no widely accepted guidelines for the treatment of patients with paraquat poisoning.¹

CORTICOSTEROIDS

Immunosuppression with methylprednisolone and dexamethasone is widely practiced, but evidence is very weak.¹

One RCT (n=299) demonstrated no evidence of improved survival with initial steroids but suggested there may be potential benefit from the subsequent two weeks of dexamethasone recommended by toxicology.⁴



ANTIOXIDANTS

Human studies are largely absent or small and uncontrolled.¹

N-acetylcysteine – Proposed benefit through free radical scavenging, anti-inflammatory and NF-κB inhibitory actions.¹

Ascorbic acid – Possible antitoxic effect.⁵ A small study suggests addition of ascorbic acid as part of the treatment was significantly associated with increased survival.⁶

Tocopherol-alpha – No effect on survival.⁷



Day ONE

Clinical toxicologist consulted
Activated charcoal 50 grams via NGT
N-acetylcysteine infusion 200mg/kg for four hours then 100mg/kg for 16 hours
Methylprednisolone 1g IV for three days followed by oral dexamethasone 8mg TDS for two weeks.
SDT urine assay - positive 35microg/mL (blue)

Day TWO to FIVE

Acute anuric renal failure and metabolic acidosis requiring haemodialysis.
Progressive respiratory failure and lung infiltrates suggestive of pulmonary fibrosis.
Hepatotoxicity, constipation, and oral mucosal ulcerations.
Trial of antioxidants
Despite maximal support the patient continued to deteriorate and died on day five.

Role of the pharmacist

- Provide evidence for, and timely supply of antioxidant therapies ascorbic acid (vitamin C) and tocopherol-alpha (vitamin E) in an acutely unwell patient.
- With limited available literature on efficacy and dosages the patient was commenced on a 2-gram daily infusion of ascorbic acid and 500 milligrams daily of vitamin E. Given the logistical and supply challenges at a regional hospital accessing IV or liquid vitamin E, the pharmacist suggested changing the dose to reflect the available vitamin E capsules (1000 international units ~ 670 milligrams of tocopherol-alpha per capsule) and provided information on administration.
- The pharmacist also highlighted the importance of early availability of a paraquat test kit to aid diagnosis and timely intervention.

Paraquat is a highly toxic herbicide that, when ingested can lead to multiorgan failure and death. Current evidence for medical management is limited and prognosis is guarded with any amount of paraquat ingestion. This case highlights the important role the pharmacist can play in a regional setting, coordinating supply and administration in an evidence scarce clinical scenario where timely action is crucial.

References

1. Gawarammana IB, Buckley NA. Medical management of paraquat ingestion. Br J Clin Pharmacol 2011;72(5):745–57.
2. Berry DJ, Grove J. The determination of paraquat (1, 1'-di(4-dimethyl-4,4'-bipyridyl) cation) in urine. Clin Chim Acta 1971;34:5-11.
3. Schermann JM, Houze P, Bismuth C, Bourdon R. Prognostic value of plasma and urine paraquat concentration. Hum Toxicol. 1987 Jan;6(1):91-3. doi: 10.1177/096032718700600116.
4. Gawarammana I, Buckley NA, Mohamed F, Naser K, Jeganathan K, Ariyananda PL, et al. High-dose immunosuppression to prevent death after paraquat self-poisoning - a randomised controlled trial. Clin Toxicol (Phila) 2018;56(7):633–9.
5. Eatamad A, Awadalla, Efficacy of vitamin C against liver and kidney damage induced by paraquat toxicity, Experimental and Toxicologic Pathology, Volume 64, Issue 5, 2012, Pages 431-434.
6. Moon JM, Chun BJ. The efficacy of high doses of vitamin C in patients with paraquat poisoning. Hum Exp Toxicol. 2011 Aug;30(8):844-50. doi: 10.1177/0960327110385633. Epub 2010 Oct 4.
7. Yasaka T, Okudaira K, Fujito H, Matsumoto J, Ohya I, Miyamoto Y. Further studies of lipid peroxidation in human paraquat poisoning. Arch Intern Med. 1986 Apr;146(4):681-5.

For more information contact: angela.faint@health.qld.gov.au



Queensland
Government