

Plant toxicities in Australian native mammals

Fact sheet

Introductory statement

A variety of native and introduced plant species may cause toxicities in Australian native mammals. Toxicity is mainly through ingestion and herbivorous host species are most likely affected. Reports of toxicity have increased in recent years, in particular mass events affecting large grazing species such as kangaroos and wombats (Boardman 2019).

Historically, little attention has been paid to plant poisonings in wildlife. Plant poisonings of wildlife may be difficult to detect and diagnose with both “obvious” acute or chronic effects, and also more subtle effects, easily missed. Histopathological investigation of affected animals is an important tool in gaining more information on the likely causes of disease in free-ranging wildlife (Steventon et al. 2018). Common effects of plant toxicities include liver disease, gastrointestinal disease, neurological disease, renal disease and skin disease. Subtle and chronic effects include reproductive impairment, growth retardation, weight loss, changes in coat etc (Fowler 1983).

Many free-ranging species have developed strategies to cope with plant toxins, including avoidance, dilution, degradation and detoxification. Factors which interfere with these natural processes may predispose animals to toxicity (Fowler 1983). Despite historical underreporting, there is almost certainly a true increase in incidence of plant toxicities in native wildlife in Australia in the past decade. Factors contributing to the increased incidence of toxic plant ingestion include extensive and prolonged drought, the dominance of degraded pastures with particular species of introduced plants and the opportunistic dominance of grasslands by invasive plant species, especially those that can adapt rapidly to changes of climate e.g. break of a drought. Predisposing illness may make individual more likely to ingest toxic plants, and less able to cope with the toxic impact (Steventon et al. 2018).

Table 1 summarises information on important plant toxicities reported in Australian mammals. Additional information is provided on some toxins. Chapter 19 “Plant and other toxicoses” in *Current therapy in Medicine of Australian Mammals* (Vogelnest and Portas 2019) and Chapter 32 “Disease caused by exogenous toxins in terrestrial mammals” in *Pathology of Australian Native Wildlife* (Ladds 2009b) provide further information.

Table 1: Some reported plant toxicities in Australian native mammals

Toxic agent	Plant	Host species affected	Regions reported	Clinical signs	Pathological changes	Epidemiological information	References
Steroid saponins	<i>Panicum gilvum</i> , (presumed)	Eastern grey kangaroos (<i>Macropus giganteus</i>)	South-east Australia	Blindness, dermatitis, photophobia, death	Jaundice, corneal oedema, uveitis, keratitis, necrotising dermatitis, hepatitis, intralesional saponin crystals	See further notes below	Steventon et al. (2018) Grillo et al. (2014)
Phalaris toxic alkaloids	<i>Phalaris</i> spp. (presumed)	EG kangaroos	South-east Australia	Ataxia, head tremors, collapse	Changes throughout brain, kidneys and heart; intracytoplasmic granules	See further notes below	Bacci et al. (2014)
		Red kangaroos (<i>M. rufus</i>)	-	-		-	Fowler (1983)
		Red-necked wallabies (<i>M. rufogriseus</i>)	Tasmania	Neurological, weight loss		Grazing on Phalaris pastures	Grillo et al. (2015)
Pyrrolizidine alkaloid	<i>Heliotropium europaeum</i> (presumed)	Southern hairy-nosed wombat (<i>Lasiorhinus latifrons</i>)	South Australia	Hair loss, dermatitis,	Liver disease	See further notes below	Woolford et al. (2014)
	?	Red kangaroo	-	Consistent with liver disease	Hepatositis	See grazing toxic plants	Fowler (1983)
	<i>Senecio jacobaea</i> (ragwort)	Pygmy possum (<i>Cercartetus</i> spp.)	-	-	Hepatositis	Presume from honey containing toxic compounds	Ladds (2009a)
Fluoroacetate	<i>Gastrolobium</i> spp. and <i>Oxylobium</i> spp.	Many mammalian species. Some more susceptible	SW Western Australia (in native plants)	Tremors, convulsions death	Non-specific changes due to heart failure	Non-adapted or recently introduced individuals. Endemic populations have innate resistance.	Fowler (1983); see also Ladds (2009a).

Toxic agent	Plant	Host species affected	Regions reported	Clinical signs	Pathological changes	Epidemiological information	References
Oxalates	Eucalypts	Koala	South Australia	Kidney disease	Crystals and damage to renal cells	See further notes below	Speight et al. (2013); (2019a; 2019b)
Cyanide	Eucalypts	Koala	Unknown	-	-	Eating unfamiliar species	Fowler (1983), quoting Everist (1974); Ladds (2009a)
Cholestatic poisons from <i>Lantana</i>	<i>Lantana camara</i>	Red kangaroos	Overseas (captive)	Anorexia, lethargy, depression, jaundice, skin disease, death	Hepatitis, secondary photosensitisation and skin changes	Lantana present in hay ingested by affected animals	Johnson and Jensen (1998)

Pyrrolizidine alkaloid hepatitis

This is also a threat to grazing livestock. In SHN wombats, it is likely that ingestion of the unpalatable plants occurred due to inexperience of animals (the plants emerged as young animals were weaned) and decreased availability of preferred plant material in a degraded environment. Lack of long term pasture management may also be a contributing factor (Boardman 2019).

Chronic phalaris toxicity

Perennial phalaris grass toxicity (aka Canary grass) is a problem in grazing livestock as well as wildlife in SE Australia. There may be seasonal variations in toxins (Boardman 2019).

Steroid saponin toxicity

Animals exhibited photophobia and shade-seeking behaviours. The pasture was dominated by invasive species and there had been a prolonged period of drought followed by rains allowing introduced weeds and grasses to dominate the pasture mix (Steventon et al. 2018).

Oxalate toxicity

The aetiology of oxalate nephrosis in koalas in some areas of Australia (Mt Lofty Ranges, SA) appears complex. There is no clear link to increased levels of oxalates in the vegetation in these areas compared to other areas, where incidence of oxalate nephrosis in koalas is much lower. There is no clear difference in the activity of oxalate-degrading gut bacteria of these populations compared to others with lower levels of the disease (Speight et al. 2013; Speight et al. 2019b). The hot dry summers in SA, with lower levels of plant hydration and less free-standing water sources, may be a contributing factor (Speight et al. 2019a). Further work is occurring to better understand this syndrome.

Surveillance

Wildlife disease surveillance in Australia is coordinated by Wildlife Health Australia. The National Wildlife Health Information System (eWHIS) captures information from a variety of sources including Australian government agencies, zoo and wildlife parks, wildlife carers, universities and members of the public. Coordinators in each of Australia's States and Territories report monthly on significant wildlife cases identified in their jurisdictions. eWHIS contains numerous reports of plant toxicity events in wildlife, mostly of phalaris toxicity in large macropod species in Victoria, Tasmania and South Australia. NOTE: access to information contained within the National Wildlife Health Information System dataset is by application. Please contact admin@wildlifehealthaustralia.com.au.

Conclusions

Reports of plant toxicities are increasing in native mammals. It may be difficult to detect signs of toxicity and determining the plant which caused the toxic changes can be extremely difficult. Disease consistent with plant toxicity should be thoroughly investigated in free-living wildlife. Further work is required to better understand which plants may be toxic to wildlife species, and the factors which may drive wildlife to consume these plants. It is likely that anthropogenic climate change will continue to drive opportunities for toxic plant ingestion by native species in Australia.

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References

- Bacci B, Whiteley P, Barrow M, Phillips P, Dalziel J, El-Hage C (2014) Chronic phalaris toxicity in eastern grey kangaroos (*Macropus giganteus*). *Australian Veterinary Journal* **92**, 504-508.
- Boardman W (2019) Plant and other toxicoses. In 'Current Therapy in Medicine of Australian Mammals.' (Eds L Vogelnest, T Portas.) pp. 315-24. (CSIRO: Collingwood).
- Fowler M (1983) Plant poisoning in free-living wild animals: a review. *Journal of Wildlife Diseases* **19**, 34-43.
- Grillo T, Cox-Witton K, Gilchrist S, East I (2015) Wildlife Health Australia. *Animal Health Surveillance Quarterly Report* **20, 4**, 4-5.
- Grillo T, Cox-Witton K, Wicks R (2014) Wildlife Health Australia. *Animal Health Surveillance Quarterly Report* **19, 2**, 6-7.
- Johnson JH, Jensen JM (1998) Hepatotoxicity and secondary photosensitization in a red kangaroo (*Megaleia rufus*) due to ingestion of Lantana camara. *Journal of Zoo and Wildlife Medicine* 203-207.
- Ladds P (2009a) Disease caused by exogenous toxins in terrestrial mammals. In 'Pathology of Australian Native Wildlife.' (Ed. P Ladds.) pp. 395-405. (CSIRO Publishing: Collingwood).
- Ladds P (2009b) 'Pathology of Australian Native Wildlife.' (CSIRO Publishing: Melbourne).
- Speight K, Breed W, Boardman W, Taggart D, Leigh C, Rich B, Haynes J (2013) Leaf oxalate content of Eucalyptus spp. and its implications for koalas (*Phascolarctos cinereus*) with oxalate nephrosis. *Australian Journal of Zoology* **61**, 366-371.
- Speight K, Colella D, Boardman W, Taggart DA, Haynes JI, Breed WG (2019a) Seasonal variation in occurrence of oxalate nephrosis in South Australian koalas (*Phascolarctos cinereus*). *Australian Mammalogy* **41**, 92.
- Speight K, Houston-Francis M, Mohammadi-Dehcheshmeh M, Ebrahimie E, Saputra S, Trott DJ (2019b) Oxalate-degrading bacteria, including *Oxalobacter formigenes*, colonise the gastrointestinal tract of healthy koalas (*Phascolarctos cinereus*) and those with oxalate nephrosis. *Australian Veterinary Journal* **97**, 166-170.
- Stevenson CA, Raidal SR, Quinn JC, Peters A (2018) Steroidal Saponin Toxicity in Eastern Grey Kangaroos (*Macropus giganteus*): A Novel Clinicopathologic Presentation of Hepatogenous Photosensitization. *Journal of Wildlife Diseases* **54**, 491-502.
- Vogelnest L, Portas T (2019) 'Current Therapy in Medicine of Australian Mammals.' (CSIRO: Collingwood).
- Woolford L, Fletcher MT, Boardman WS (2014) Suspected pyrrolizidine alkaloid hepatotoxicosis in wild southern hairy-nosed wombats (*Lasiorninus latifrons*). *Journal of Agricultural and Food Chemistry* **62**, 7413-7418.

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