- ± haemorrhagic colitis
- subepicardial, subendocardial and myocardial haemorrhage

Diagnosis: history of access + sudden death + identify plant in ingesta

Therapy:

- nil recorded
- possibly worth applying therapy used for cardiac glycosides (activated charcoal, fluids, antiarrhythmic drugs)

Prevention & control: prevent access

References: Se50 - note incorrect spelling

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Diterpenoid alkaloids - Delphinium *spp.*

Plant sources: *Delphinium* spp. (larkspurs) in North America

Ruminants mostly affected

Sudden death or syndrome dominated by weakness, dyspnoea, collapse.

Therapy: physostigmine IV, IP or SC @ 0.04-0.08 mg/kg (Pfister *et al.* 1994)

References:

Pfister JA, Panter KE, Manners GD, Cheney CD (1994) Reversal of tall larkspur (*Delphinium barbeyi*) poisoning in cattle with physostigmine. *Vet. Human Toxicol.* **36**:511-514.

Tropane alkaloids [scopolamine (=hyoscine), hyoscyamine, atropine and others]

Sources:

Family Solanaceae

**Atropa belladona* (deadly nightshade) – very rare in Australia, native of Europe

Hyoscyamus spp.

**Hyoscyamus niger* L. (black henbane) - rare in Australia, native of Europe

**Hyoscyamus albus* L. (white henbane) - rare in Australia, native of Europe

Duboisia spp. (corkwoods) (Purdie *et al.* 1982)

Duboisia leichhardtii (corkwood) [DM152]

Duboisia myoporoides (corkwood) [DM152] (Barger *et al.* 1937, 1938)

Duboisia leichhardtii x *D. myoporoides* (hybrid corkwood) grown commercially around Kingaroy as a source of pharmaceuticals, mainly scopolamine (hyoscine).

Datura spp. (thornapples)

6 species (1 native) growing under natural conditions in Australia (Purdie *et al.* 1982)

****Datura stramonium*** L. (common thornapple, Jimson weed [USA]) [DM127]
****Datura ferox*** L. (fierce or longspine thornapple) [DM126]
Datura leichhardtii F.Muell. (native thornapple)
**Datura inoxia* Miller (downy thornapple)
**Datura wrightii* Regel (hairy thornapple)
**Datura metel* L.

Garden plants alternately known as *Brugmansia* spp. (angel's trumpets):

Datura arborea
Datura aurea [= *Brugmansia aurea*]
Datura candida
Datura suaveolens
Datura sanguinea

***Datura* species**	**Sample origin**	**Plant part**	**Total alkaloid content %**	**Scopolamine (= Hyoscine) g/kg**	**Atropine g/kg**	**Hyoscyamine g/kg**	**Reference**
Datura spp.	North America	All	0.25-0.7				Kingsbury 1964
D. stramonium	Australia	Seed	0.026-0.210 mean = 0.11 n = 7				Griffin 1972
	Australia	Seed		0.42-0.45 n = 3		1.54-3.25 n = 3	Connor *et al.* 1990
	USA	Seed		0.36-0.69	1.69-2.71		Friedman *et al.* 1990
	Europe	Seed	0.58				Frohne & Pfänder 1984
	"	Leaf	0.38				"
	"	Flower	0.61				"
	"	Fruit	0.66				"
	"	Shoots	0.16				"
	"	Pericarp	0.05				"
	"	Roots	0.23				"
D. ferox	Australia	Seed	0.012-0.47 mean = 0.082 n = 9				Griffin 1972
	Australia	Seed	0.07				Hall 1972
	Australia	Seed	0.12				Springhall & Seawright 1972
	Australia	Seed		0.41-0.77 n = 2		0.15-0.25 n = 2	Connor *et al.* 1990
D. leichhardtii	Australia	Leaves	0.33				Everist 1981
		Stems	0.07				"
		Roots	0.31				"
D. inoxia	USA	Stems & dry capsules		0.030-0.036			Gerlach 1948
		Roots & seeds		0.040-0.045			"
		Leaves		0.056			"
		Green fruit		0.083			"
		Calyx		0.112			"
D. candida	Australia	Leaf	0.86	0.062			Griffin 1966
		Flowers	0.60	0.053			"
		Stems	0.44	0.032			"
		Roots	0.26	0.010			"
		Young roots	0.32	0.022			"

Hyoscine (scopolamine) as its butylbromide or hydrobromide is an active ingredient of a number of **pharmaceutical preparations** including those with the trade names Atrobel,® Atrobel Forte®, Buscopan®, Contac Cold Capsules® Donnagel Suspension,® Donnalix Elixir & Infant Drops®, Donnatab®, Hyoscine Injection BP, Kwells®, Travacalm®, Travacalm HO® used variously as a pre-treatment before anaesthesia and for treating or preventing spasm of the alimentary tract, motion sickness or head colds (Caswell 2000).

Toxicity: all species
Mode of action: sympathetomimetic
Conditions of poisoning:

- The green plants themselves are very unpalatable making poisoning by them rare
- *Datura* seed contamination of feed grains (pigs, poultry, cattle, horses); crushed seeds are much more toxic than whole seeds
- *Datura* sp. plants contaminating hay (TW Naudé, personal communications, VETTOX discussion group, 17 May 2000)
- airborne dust from *Duboisia* processing (humans, dog, cat)
- Human use of angel's trumpets as hallucinogens (Hayman 1985) or accidentally in foods or herbal medicines (Chang *et al.* 1999)
- Dog ingesting flowers from a garden shrub (*Brugmansia aurea*) (Symon 2002)

Clinical signs:

dilation of pupils / impaired vision
dry mouth & nose
constipation
tachycardia
flushing of pale skin (pigs)
↓ urination
↑↑ thirst
↓ respiration
± paralytic ileus / impaction colic (horses – Schulman & Bolton 1998, TW Naudé, personal communications, VETTOX discussion group, 17 May 2000)
restlessness, delirium
convulsions
paralysis → coma, death

Pathology:

gastric rupture (horses – Schulman & Bolton 1998)

Diagnosis:

history and clinical signs
A drop of urine from an intoxicated animal placed into a cat's conjunctival sac produces pupil dilation.

Therapy: physostigmine
Prevention & control: maximum safe *Datura* seeds: pig feed 0.4 g/kg, cattle feed 10 seeds/kg.
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Tropane alkaloids - Convolvulus arvensis *(field bindweed) – horses*

North America; horses; *Convolvulus arvensis*-dominated pasture mediated through prairie dog removal of tall vegetation cover; weight loss & chronic colic; necropsy – intestinal fibrosis and vascular sclerosis of small intestine; tropane alkaloids isolated (among others) and suggested as possible cause
Reference:

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Glycosidic steroidal alkaloids (glycoalkaloids) of Solanum *spp. (nightshades)*

Core data

Common sources: Solanum spp. (*S. sturtianum, S. tuberosum*)
Animals affected: ruminants
Mode of action:

- direct alimentary irritation
- ± depression
- haemolysis

Poisoning circumstances:

- unripe fruit
- green potato tubers eaten

Main effects: gastroenteritis
Diagnosis: syndrome + access
Therapy:

- remove from source
- rehydrate, adsorbents, demulcents

Prevention: deny access to unripe fruit, green potato tubers

Chemical structure:
Glycosidic steroidal alkaloids (glycoalkaloids): solanine, solasonine, tomatine *et al.*

Sources:
Family Solanaceae

Members of the Family Solanaceae may have a general reputation for toxicity because several species in Europe and the United Kingdom are well known for being toxic, e.g. *Atropa belladonna* (deadly nightshade), *Hyoscyamus niger* (henbane) and *Datura stramonium* (thornapple). Despite this, there are relatively few reports of livestock toxicity from *Solanum* species in Australia. In fact, Australian aboriginal people used the fruits of species such as *Solanum centrale* as a major food source in the arid zone.

***Solanum* spp.** (nightshades)

There are 117 recognised species in Australia (Symon 1981, Purdie *et al.* 1982). Very few species have been definitely associated with poisoning of livestock. Those known or seriously suspected to be toxic in Australia (important species in bold, naturalised indicated by prefix *) include:

***Solanum aviculare* Group** (kangaroo apples). Members of this species complex are suspected of poisoning cattle and there is some evidence of toxicity from feeding trials (Hurst 1942), but precise identification of plants involved is uncertain (Everist 1981). Species in the complex are:

Solanum aviculare G.Forster: solasodine - leaves 0.3-3.1%, stems 0.2-0.4%, green fruits 1.7-3.5%, ripe fruits 0.8-1.7% (Bradley *et al.* 1978)

Solanum capsiciforme (Domin) Baylis: solasodine - leaves o.4-1.1%, stems 0.1-0.2%, fruits 0.6% (Bradley *et al.* 1978)

Solanum laciniatum Aiton: solasodine leaves 1%, stems 0.1%, green fruits 0.3-3.5%, ripe fruits 0.1-0.3% (Bradley *et al.* 1978)

Solanum linearifolium Herasim. ex Symon (mountain kangaroo apple)

Solanum simile F.Muell.: solasodine - leaves 0.5-2.1%, stems 0.1-0.6%, fruits 1.4-1.6% (Bradley *et al.* 1978)

Solanum symonii H.Eichler: solasodine - leaves 0.6-0.8%, stem 0.2%, fruit 0.6% (Bradley *et al.* 1978)

Solanum vescum F.Muell.: feeding trials in cattle with plants attributed to this taxon in New South Wales produced death (single doses of 1.4-2.8 kg green fruits) or gastroenteritis (0.4-1.4 kg green fruits) in one experiment and salivation and bloating (2.8 kg fruits) and salivation (0.9 & 3.6 kg fruit) in a later experiment (Hurst 1942).

**Solanum capsicoides* All. [= *S. aculeatissimum* Jacq.] (devil's apple); single case reported of a calf developing gastroenteritis with blood in mucoid faeces after eating a number of berries (Hurst 1942). Solanine has been reported in immature fruit (5%) and ripe fruit (1.5%) (Watt & Breyer-Brandwijk 1962)

Solanum chenopodinum F.Muell. ; suspected as poisoning livestock (Hurst 1942, Gardner & Bennetts 1956); 0.1% solasodine detected in fruits (Bradley *et al.* 1978). Solasodine has been reported from fruit (0.1%) (Bradley *et al.* 1978).

Solanum cinereum R.Br. (Narrawa burr); Solanine has been detected (McBarron 1977). Sheep are suspected of being poisoned in New South Wales (Hurst 1942). Fresh or dried fruits were experimentally toxic to sheep (Dodd 1923). Fatal doses were about 225 g when administered in water; similar doses without water were not toxic. Main effect was gastroenteritis with diarrhoea.

**Solanum dulcamara* L. (bittersweet, bitter or woody nightshade, bittersweet, felonwort, blue bindweed, climbing nightshade); toxicity reported in cattle, sheep and horses in Europe and North America, but not in Australia. All parts of the plant are reported to contain solanine (Cooper & Johnson 1998).

**Solanum elaeagnifolium* Cav. (white horsenettle, silver nightshade, tropillo); solasodine - fruits 0.4-2.0%, seeds 3.1% (one sample), leaves & stems virtually nil (Bradley *et al.* 1978). Experimentally toxic to sheep in North America - cattle dosed with ripe fruits at 0.1-0.3% of body weight (Kingsbury 1964). No cases of poisoning have been reported in Australia (Everist 1981).

Solanum ellipticum R.Br. (potato weed, potato bush, wild goose-berry); solasodine - fruits 0.5% in one plant, leaves & stems nil (Bradley *et al.* 1978). Field cases have been reported in sheep, cattle and horses (Hurst 1942, Chippendale & Murray 1963), but firm evidence is lacking (Everist 1981). An adult sheep fed 1.08 kg of crushed whole plant from central Queensland over 7 days was unaffected (Everist 1981).

Solanum eremophilum F.Muell. (potato weed, potato bush, wild goose-berry); suspected of toxicity, but evidence inconclusive (Everist 1981).

Solanum esuriale Lindl. (quena, potato weed, potato bush, wild tomato); solasodine - fruits 0.2-0.3% in one sample, leaves and stems nil (Bradley *et al.* 1978). Cases associated with gastroenteritis have been reported from New South Wales , but feeding trials have been negative (Hurst 1942). Suspected of causing "humpyback" of sheep (*q.v.*).

**Solanum linneanum* [= *S. hermannii* Dunal., *S. sodomaeum, S. sodomeum*] (apple of Sodom, devil's apple); The glycoside solasonine is reported and sheep have been fatally poisoned by 400 g unripe fruit (Watt & Breyer-Brandwijk 1962). Ripe fruits were fatally toxic when fed to birds (Japanese quail and poultry chicks) at 2-3% of the diet (Ross & Furumoto 1970). Associated with cases of enzootic calcinosis (*q.v.*).

**Solanum mauritianum* Scop. [= *S. auriculatum*] (wild tobacco tree); solasodine - leaves 0.1%, stems 1.1%, fruit 1.1% (Bradley *et al.* 1978). Field cases have been reported in pigs and cattle in Queensland (Everist 1981). Experimental intoxication with immature fruits dosed PO killed guinea-pigs with acute gastroenteritis (AA Seawright 1969, personal communication to Everist 1981).

Solanum nigrum Group (black-berry nightshades). These plants may be erroneously called deadly nightshade. Members of this species complex have been suspected of poisoning domestic animals through consumption of leaves or unripe fruit (Hurst 1942). Species in the complex are
Solanum americanum Miller [= *S. nodiflorum* Jacq.]
**Solanum chenopodioides* Lam. [= *S. gracilius* Herter]
**Solanum furcatum* Dun.
Solanum melanocerasum All. (huckleberry); cultivated
**Solanum nigrum* L. (black-berry nightshade, black nightshade)
Solanum opacum A.Br. & Bouche
**Solanum retroflexum* Dun.
**Solanum sarrachoides* Sendtner [= *S. nitidibaccatum* Bitt.]
**Solanum villosum* Mill.

Solanum oldfieldii F.Muell.; solasodine - trace found in leaf and stem (Bradley *et al.* 1978). Suspected of poisoning stock in Western Australia, but feeding trials negative (Gardner & Bennetts 1956).

Solanum petrophilum F.Muell. ; solasodine - fruits 0.4&; leaves & stems nil (Bradley *et al.* 1978). Suspected of poisoning stock (Hurst 1942, Gardner & Bennetts 1956), but confirmation lacking (Everist 1981).

**Solanum pseudocapsicum* L. (Madiera winter cherry, Jerusalem cherry); cultivated & sparingly naturalised; solanocapsine - leaf & stem (Qld origin) 0.5%, fruit (Victorian origin) 0.2% (Bradley *et al.* 1978). No toxicity record in Australia (Everist 1981). Minor evidence from African material (Watt & Breyer-Brandwijk 1962).

Solanum quadriloculatum F.Muell. (wild tomato, tomato bush); A strong positive test for alkaloids was obtained from fresh and dried fruits of Northern Territory origin (Chippendale & Murray 1963). One fruit sample from Queensland

yielded no solasodine (Bradley *et al.* 1978). Field and experimental evidence of toxicity exists for immature fruits from Northern Territory plants for sheep, producing stiff gait in the hindquarters, staggering, rapid irregular breathing and collapse before death (Chippendale & Murray 1963). Necropsy revealed congestion ("inflammation") of trachea, lungs, heart, liver, abomasum and small intestines.

**Solanum rostratum* Dun. (buffalo burr, pincushion nightshade); Poisoning of pigs is reported to cause severe haemorrhagic enteritis and ulceration (Kingsbury 1964). Everist (1981) misquotes Hurst (1942) as reporting cases in cattle.

****Solanum seaforthianum*** Andr. (Brazilian nightshade); solasodine - leaf & stem 0.3%, green fruits 0.3% (Bradley *et al.* 1978). Field cases from eating fruits have been reported in children and poultry (Hurst 1942), and from eating the plant in cattle, pigs and sheep (Everist 1981). Feeding trials in sheep force-fed whole plant, fruits or both (4.1 kg fruits, first green, later ripe; 5.7 kg whole plant; feeding periods 10-21 days) produced anorexia and diarrhoea (Everist 1981). Necropsy findings were non-specific.

**Solanum sisymbriifolium* Lam. Fruits suspected of poisoning a child in Africa (Watt & Breyer-Brandwijk 1962). No reports of toxicity in Australia (Everist 1981).

Solanum sturtianum F.Muell. (Sturt's nightshade, Thargomindah nightshade) has poisoned cattle and sheep on stock routes in western Q & NSW (Hurst 1942, Seddon & Carne 1925a,b, Seawright 1954). Experimental poisoning has been established in sheep and cattle with ripe fruits (0.45 kg sheep; 1.36 kg 2-year-old steer) force fed and followed by large amounts of water (Seddon & Carne 1925a,b). Signs began 1-2 days after feeding, consisting of marked depression, profuse diarrhoea, wasting and eventual death. Necropsy revealed severe gastroenteritis.

**Solanum torvum* Swartz [= *S. largiflorum*] (devil's fig); solasodine - ripe fruits (Qld origin) 0.2% (Bradley *et al.* 1978). Associated with cases of enzootic calcinosis (*q.v.*) in Papua-New Guinea.

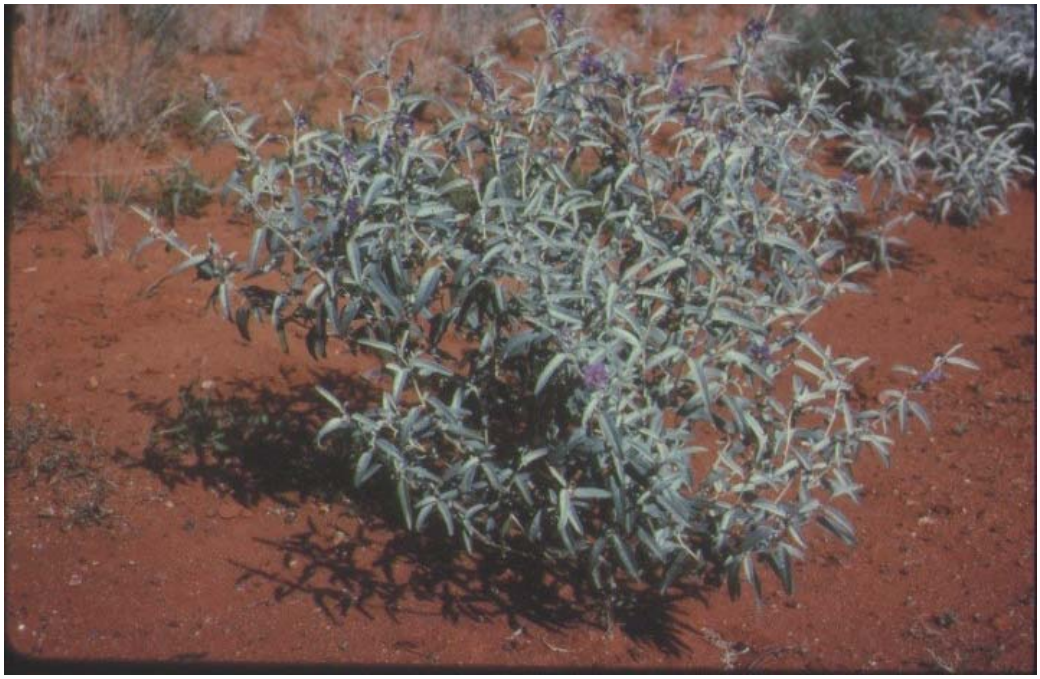
**Solanum triflorum* Nutt. (cutleaf nightshade, three-flowered nightshade); solasonine and solasodine reported (McBarron 1977). Field cases have been suspected in sheep and cattle in New South Wales and experimental feeding of one sheep with 0.45 kg pulped fruit caused slight enteritis (diarrhoea) (Hurst 1942).

****Solanum tuberosum*** (potato). Cultivated (originating from South America). Tops and tubers may be toxic; tubers after exposure to sunlight turns them green or the sprouts from tubers.

Other species of *Solanum* with poorer evidence of toxicity (Everist 1981) include:
Solanum campanulatum R.Br.; solasodine - fruit 0.7%
Solanum elegans Dunal [= *S. amblymerum*]
Solanum erianthum D.Don
**Solanum hispidum* Pers. (giant devil's fig)
**Solanum jasminoides* Paxt. (potato creeper)
**Solanum stelligerum* Smith [= *S. lucorum* Domin] (devil's needles)
**Solanum mammosum* L. (nipple plant, udder plant)
Solanum melanospermum F. Muell.
**Solanum melongena* L. (egg plant, aubergine)
Solanum nemophilum F.Muell.
Solanum wendlandii Hook.f.
Solanum prinoiphyllum Dunal [= *S. xanthocarpum* Schr., *S. armatum* R.Br.] (toothed nightshade)

**Lycopersicon lycopersicum* (L.) Karsten ex Farwell [= *L. esculentum* Miller] (tomato) plants have poisoned cattle in Queensland (JA Gibson unpublished data).

Representative *Solanum* plant. Note the 5-petalled flowers with prominent yellow staminodes and globular berry fruit. Flower petal colour is usually purple, but may be white in some species. Mature fruit colour varies and may be green, yellow, red, orange, brown or black. [RAM Photo]



Flowering and fruiting *Solanum strutianum* (Thargomindah or Sturt's nightshade) (above) and fruiting branches (below) [RAM Photos]

Solanum mauritianum (wild “tobacco”) [RAM Photo]

Solanum nigrum (black-berried nightshade) [RAM Photo]

Solanum pseudocapsicum [RAM Photo]

Toxicity:
- ruminants (humans)
- toxins concentrated in fruits; green potatoes

Mode of action:
- irritant to alimentary tract; poorly absorbed
- if absorbed → CNS depression, haemolysis
- minor anticholinesterase, cardiac glycoside-like and protease inhibition activities (not clinically significant) (Nishie *et al.* 1976, Bushway *et al.* 1987)

Conditions of poisoning:
- in general, **unripe fruit** are the **most toxic** part of these plants
- *S. sturtianum* has induced severe diarrhoea in animals on stock routes **after drinking**
- *S. tuberosum*: green tubers fed to livestock

Clinical signs:
- severe **diarrhoea**
- ± depression, stupor
- ± haemoglobinuria

Pathology: gastroenteritis

Diagnosis: syndrome + access

Therapy:
- remove from source
- rehydrate + adsorbents + demulcents

Prevention & control: deny access to susceptible stock

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Quinolizidine alkaloids - Thermopsis montana

Chemical structure:

quinolizidine alkaloids with an α-pyridone A-ring probably responsible (Keeler & Baker 1990)

Source:

Thermopsis montana (Family Fabaceae)

Toxicity:

North America only; cattle affected

Clinical signs & Pathology:

Skeletal muscle degeneration & necrosis

References:

Baker DC, Keeler RF (1989) *Thermopsis montana*- induced myopathy in calves. *J. Am. Vet. Med. Assoc.* **194**:1269-1272.

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Steroidal alkaloids - Veratrum, Solanum tuberosum

Syndrome names: Cyclops or monkey-face lambs
Sources:
- ***Veratrum californicum*** (contains **cyclopamine**)
- *Solanum tuberosum* (potato - contains solasodine and others)

Toxicity:
- sheep
- North America
- *V. californicum* teratogens = cyclopamine, cycloposine, jervine; over 40 other steroidal alkaloids present but not teratogenic
- solasodine and other steroidal alkaloids found in sprouting potatoes (*Solanum tuberosum*) are teratogenic in very high doses for certain hamsters - no credible link with congenital defects in domestic animals or humans (Morris & Lee 1984).

Mode of action:
- cyclopia from disturbance of embryo development during neural tube stage
  - alkaloids interfere with catecholamine-secreting cells in embryonic neuroepithelium → inhibition of catecholamine release → disrupts normal migration and development of embryonic cells
- bone and tracheal defects from interference with cartilage metabolism

Conditions of poisoning:
- *V. californicum* or cyclopamine ingested on day 14 of gestation in sheep → cyclopia
- ingested at day 28-30 → shortened metatarsal and metacarpal bones ± cleft lip & palate
- ingested at 27-33 → tracheal stenosis

Clinical signs:
- prolonged gestation
- congenital deformities

Pathology:
- **cyclopia**
- shortened metatarsals & metacarpals
- tracheal stenosis

Diagnosis: pathology + access
Therapy: nil
Prevention & control:
- deny access to source at critical times of gestation (mate ewes after first frosts kill *V. californicum*)

References:

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Isoquinoline alkaloids - Argemone *spp. (Mexican poppy)*

Sources:

Family Papaveraceae:
Argemone mexicana (Mexican poppy)
Argemone ochroleuca (Mexican poppy)

Flowering and fruiting *Argemone ochroleuca* (Mexican poppy) [RAM Photo]

Toxicity:
- ruminants, poultry
- all parts of the plants are toxic, including seeds
- dried plants retain toxicity

Conditions of poisoning:

Cattle fed whole plants in hay in South Africa (Kellerman *et al.* 1988) and Australia (BD Hill unpublished data) → ventral subcutaneous oedema, ascites, hydrothorax, cardiomyopathy

Chickens fed diets contaminated by *Argemone* seeds → subcutaneous oedema, hydropericardium, pulmonary oedema

References: Se12

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Iforrestine

Chemical structure:

iforrestine is a heterocyclic alkaloid isolated from *Isotropis forrestii*.

Sources:

- ***Isotropis*** spp. (Family Fabaceae) 14 species in Australia, 7 associated with poisoning, namely
  Isotropis atropurpurea (poison sage - WA,NT)
  Isotropis cuneifolia (lamb poison, granny bonnets- WA)
  Isotropis drummondii (WA)
  Isotropis foliosa (NSW)
  Isotropis forrestii (WA)
  Isotropis juncea (slender lamb poison - WA)
  Isotropis wheeleri (Wheeler's lamb poison - NSW).

Toxicity:
- sheep & cattle
- plants very palatable..
- rapid intake of 0.5-1.0kg by a sheep → sudden death

Mode of action: acutely nephrotoxic

Conditions of poisoning:
- poisoning reported from Western Australia, Northern Territory, New South Wales.
- fresh new growth or flowering/fruiting plants, most often in spring

Clinical signs:
- anorexia
- diarrhoea
- oliguria/anuria
- muscle weakness
- recumbency
- death within several hours to several days

Pathology:
- ↑ serum urea & creatinine
- perirenal oedema
- pale kidneys
- necrosis of proximal renal convoluted tubules
- oedema of abomasal wall
- ± liver necrosis

Diagnosis: access + pathology

Therapy: nil

Prevention & control:
- prevent access
- risk to livestock has been significantly reduced in south-western Australia through cultivation, making poisoning rare (JG Allen, personal communication 2000)

References: Se65

Colegate SM, Dorling PR, Huxtable CR, Shaw TJ, Skelton BW, Vogel P, White AH (1989) (+)-Iforrestine: a novel heterocyclic nephrotoxin from *Isotropis forrestii*. *Aust. J. Chem.* **42**:1249-1255.

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Gardner MR, Royce RD (1967) Poisoning of sheep and cattle in Western Australia due to species of *Isotropis* (Papilionaceae). *Aust. J. Agric. Res.* **18**:505-513. [*I. cuneifolia, I. drummondii, I. forrestii*]

McEwan D (1992) *Isotropis atropurpurea. Vet. Pathol. Report (ASVP Newsletter)* No.33, p.41. [NT; cattle]

Colchicine and related alkaloidal amines

Syndrome names:

Chemical structure:

Colchicine, colchiceine and gloriosine are alkaloidal amines, these being alkaloids that do not contain a heterocyclic nitrogen atom.

Sources:

Plants of the Family Liliaceae

Colchicum autumnale L. (meadow saffron, autumn crocus, naked ladies, naked boys) and other *Colchicum* spp. There are about 65 species of *Colchicum*, all native

to Europe (Mabberley 1997). Colchicine contents of *C. autumnale* plant parts are: seeds 0.3-0.8%; corm 0.6%; flowers 0.1% (

Gloriosa superba L. (glory lily, flame lily, gloriosa). There are 1-6 species of *Gloriosa*, all native to the Old World tropics (Africa, Asia) (Mabberley 1997) and widely cultivated in gardens. *G. superba* is native to Africa and Asia and is a naturalised garden-escape weed in coastal areas of northern NSW and south-eastern Qld, Australia (Conran 1987). Colchicine content is about 0.3% (Goonaratne 1966). Tubers contain about 3 mg colchicine /g.

Therapeutic drug for the treatment of gout

Organ systems affected:

Toxicity:

Natural cases of poisoning by *Colchicum autumnale* are recorded in cattle, sheep, horses, pigs, goats, dogs, zoo animals and laboratory animals (Cooper & Johnson 1998).

Cattle: Lethal dose has been estimated at 8-16 g fresh leaves of *Colchicum autumnale* / kg

Sheep: Lethal dose for lambs aged 2-3 months has been estimated at 6.4 g fresh leaves of *Colchicum autumnale* / kg

Macropods: Deaths of swamp wallabies (*Wallabia bicolor*) on the northern coast of NSW have been attributed to browsing on *Gloriosa superba* naturalised on coastal sand dunes (Benson 2001), but direct evidence is lacking.

Humans: The lethal dose of *Colchicum autumnale* plant for adults is *ca.* 5 g and *ca.* 1.0-1.5 g for children. The lethal dose of colchicine itself is in the range 7 to 200 mg, usually lying between 30 and 80 mg. (Frohne & Pfänder 1984)

Mode of action:

Colchicine has several actions including capillary dilation, neurotoxicity causing first central excitation then depression, neuromuscular blockade and an anti-mitotic effect.

Conditions of poisoning:

Grazing animals consuming *Colchicum autumnale* on first introduction to spring pasture.

Pigs fed green feed containing *Colchicum autumnale*.

Dried plant material retains toxicity: horses have been poisoned by hay contaminated with 1.5% *C. autumnale* (Kamphues & Meyer 1990).

Colchicine is secreted in milk, poisoning neonates and humans.

Humans: Consumption of tubers of *Gloriosa superba* when mistaken for yams; consumption of flowers, corms, seeds or seed capsules of *Colchicum autumnale*. Overdosing with gout medication either accidentally or deliberately (suicide or homicide attempts).

Clinical signs:

Domestic animals (Cooper & Johnson 1998):

abdominal pain, bruxism (teeth grinding)
ptyalism (hypersalivation)
severe diarrhoea often with blood in faeces
coldness of extremities
lethargy
decreased milk production
incoordination
recumbency
death from respiratory or circulatory failure

Humans – acute poisoning (Frohne & Pfänder 1984):

Latent period of 2-6 hrs after ingestion
Burning, tingling sensations in the mouth
Difficulty with swallowing
Nausea & vomiting, abdominal cramps
Diarrhoea with blood in faeces
Reduced body temperature
Hypotension
Convulsions, paralysis; death from respiratory paralysis

Humans – subacute poisoning:

Hair loss (Goonaratne 1966)
Thrombocytopaenia, leucopaenia

Pathology:

acute gastrointestinal inflammation
widespread haemorrhages

lysis of lymphocytes in lymphoid organs

Diagnosis:

Access + syndrome + plant parts in rumen (difficult to identify)

Assay rumen contents for colchicine – a thin layer chromatography method has been developed (Kasim & Lange 1973)

Therapy:

Standard decontamination measures + supportive measures. Prognosis poor.

Humans have been treated successfully with colchicine-specific Fab fragments (Scherrmann *et al.* 1992).

Prevention & control: Deny access.

References:

Human toxicity profile of *Gloriosa superba :* http://www.inchem.org/documents/pims/plant/pim245.htm

Benson S (2001) Killer takes root in our backyards. *Brisbane Sunday Mail* 4 March 2001, p. 33.

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Mabberley DJ (1997) *The Plant-Book.* 2nd edition. Cambridge University Press, Cambridge. p.170.

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Tribunskii MP (1970) [*Colchicum autumnale* poisoning in lambs.] *Veterinariya, Moscow* **6**:71-72.

*Cocaine (*q.v.*)*