



Pimelea poisoning in cattle

2nd edition

Pimelea poisoning in cattle

Pimelea poisoning is a potentially fatal disease of cattle, most commonly seen in south-west Queensland, north-west NSW and northern SA. It is also known as St. George disease (after the region where it was first reported), Marree disease, 'big head' (not to be confused with 'big head' in the horse, which can be caused by buffel grass) and flaxweed poisoning. The disease is usually caused by accidental consumption of toxic varieties of the native plant pimelea.

Pimelea plants

Pimelea is a small native herb that is mainly found in inland areas of Australia, below the Tropic of Capricorn. It is also known as native rice-flower, flaxweed or poverty weed. Although 37 different species of pimelea are found in Australia, only 13 occur in areas where pimelea poisoning is seen in cattle. Of these, only three species are usually associated with the disease: *Pimelea simplex*, *Pimelea trichostachya* and *Pimelea elongata*.

The plants are winter growing annuals which flower in spring and grow to a maximum of about 50cm high. Pimelea thrive in light red, sandy, less fertile soils, particularly in overgrazed pastures and old cultivation paddocks. In some pastures pimelea will become the dominant species, forming dense stands. The plants may also grow among grass tussocks. Photographs of the whole plant and seed heads of each of the problem species can be found in figures 1, 2 and 3. It is important for cattle producers in affected regions to be able to recognise the plants in order to predict when individual paddocks may pose a poisoning risk for stock.

Figure 1: *Pimelea simplex*



Photo: Jenny Milson, © DPI&F, Queensland (2006)

Figure 2: *Pimelea trichostachya*



Photo: Jenny Milson, © DPI&F, Queensland (2006)

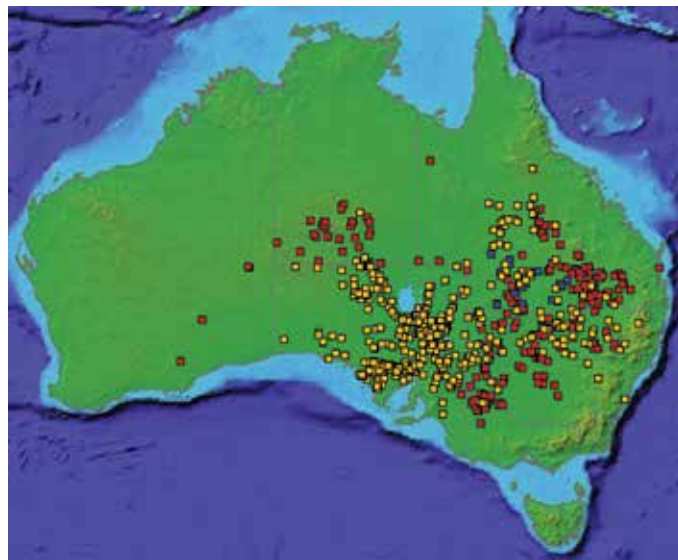
Figure 3: *Pimelea elongata*



Photo: Jenny Milson, © DPI&F, Queensland (2006)

Historically, pimelea poisoning has been considered a regional problem, mainly occurring around the St. George district in south-west Queensland. However, as shown on the map in figure 4, three poisonous pimelea species are now found throughout beef cattle regions of Queensland, NSW, SA and the NT, extending over about one quarter of Australia's pastoral lands.

Figure 4: Distribution of pimelea species known to cause poisoning in cattle



■ *Pimelea simplex* ■ *Pimelea trichostachya* ■ *Pimelea elongata*

History of pimelea poisoning in Australia

Diarrhoea in sheep grazing on pimelea was first reported in Australia in 1887. Sheep are less susceptible to pimelea poisoning than cattle, and diarrhoea is usually the only symptom seen in this species.

The serious illness was first described in cattle in 1947, following outbreaks in the St. George district of Queensland and also around Cunnamulla, Chinchilla, Roma and Rockhampton. These early cases all occurred in inferior sheep country, where cattle were kept as an additional source of income. The disease was also reported in cattle that were driven from the NT to Marree in SA.

In the late 1960s and early 1970s, sheep production in inland areas of south-west Queensland and north-west NSW was in decline; producers increasingly turned to

cattle farming. Prolonged grazing by sheep had altered the natural vegetation in these areas, leading to an increase in the density of pimelea plants in many pastures. Since 1966 there have been regular outbreaks of pimelea poisoning, with an increasing number of regions and land holders affected. Economic losses to the livestock industry have been significant. In 1990 it was estimated that pimelea poisoning cost the south-west Queensland beef industry up to \$10 million annually as a result of cattle deaths, reproductive losses and lowered beef production. These losses are now likely to be considerably greater due to the widening distribution of toxic pimelea plants and poisoning outbreaks, and increased presence of cattle in traditional sheep areas. The increased value of beef makes the likely financial cost even higher.

Figure 5: Significant historic milestones in the pimelea story

Year	Significant event
1887	Diarrhoea reported in sheep grazing on pimelea
1947	A syndrome named 'St. George disease' first described in cattle in Queensland
1965	Marree disease reported in cattle in SA
1969	St George disease in cattle first linked to contact with pimelea plants
1971	Clinical signs of pimelea poisoning linked to constriction of blood vessels in the lungs
1975	A toxin known as simplexin isolated from Pimelea simplex
1976	The site of action for simplexin shown to be blood vessels in the lungs
1976	Simplexin shown to cause permanent constriction of lung veins in laboratory studies
1994	Vaccine developed to produce antibodies (anti-toxins) against pimelea toxins; unfortunately the vaccine was not able to protect cattle against poisoning or hasten recovery in affected animals.

Pimelea research projects

Meat & Livestock Australia (MLA), and previously the Meat Research Corporation, have actively supported a number of research projects into pimelea poisoning and its potential treatment, prevention and control. The results of this research have provided much of the information included in this booklet.

Research areas supported by MLA since 1990 include:

- Background research on the ecology (lifecycle) of pimelea plants
- Risk factors for pimelea poisoning (both property and animal factors)
- Surveys on the incidence, risk factors and economic significance of pimelea poisoning
- Studies into the toxic effects of pimelea in cattle
- Identification of specific toxins in pimelea
- Development of laboratory tests to measure toxin levels in pimelea plants
- Studies on the feasibility of immunisation of cattle against pimelea poisoning
- Development and field testing of vaccines to protect cattle against pimelea poisoning
- Evaluation of an experimental antidote for treatment of poisoned cattle
- Evaluation of other control therapies for treatment of poisoned cattle
- Methods to reduce the risk of pimelea poisoning in cattle

Pimelea poisoning

Pimelea plants contain a number of toxins. The main one is known as simplexin and has been shown to damage both the intestines and lungs, due to its effect on the smooth muscle tissue of those organs. Cattle can suffer from either acute or chronic pimelea poisoning, depending on the length of time they are exposed to the plant:

- Acute poisoning usually results from consumption of green pimelea plants and leads to severe, potentially fatal, diarrhoea. It can be seen in sheep and horses as well as cattle. Some animals die within 24 hours of showing symptoms, however most will recover within two weeks if they are moved to pimelea-free paddocks.
- Chronic poisoning only occurs in cattle, and leads to the syndrome known as St. George or Marree disease. It can be caused by ongoing, accidental consumption of toxic plants or inhalation of dry plant dust (inhaled dust is subsequently coughed up and swallowed).

The first sign of chronic poisoning is often diarrhoea, due to the effect of the toxins on the gut. In cattle, pimelea toxins also cause constriction of small blood vessels in the lungs. Blood plasma is forced out of the circulation due to the increase in pressure in these veins, and fluid accumulates in the chest cavity and gravitates to the lower parts of the body, including the brisket and/or head (leading to the common name of 'big head') (see figures 6-9).

Figure 6: *Bos indicus* steer in yards with swollen jowl and brisket



Photo: Denis Burton

Figure 7: *Bos indicus* with swollen brisket



Photo: Denis Burton

Figure 8: Shorthorn heifer with swollen jowl, slight swelling of brisket



Photo: Denis Burton

Figure 9: Scouring shorthorn calf with slightly swollen jowl



Photo: Denis Burton

As the condition worsens the oedema (soft swelling) may extend to the front legs, abdomen and even the udder. The constriction of blood vessels in the lungs eventually leads to chronic heart failure.

If affected cattle remain on toxic pastures they are likely to develop kidney and liver damage. They rapidly lose body condition and become anaemic, and their coats become rough. They are usually depressed and have obvious, laboured breathing. Death can occur suddenly, often during exertion such as mustering, due to excessive strain on their weakened hearts, and anaemia.

Alternatively they may remain sick for long periods of time, leading to poor growth and reproductive performance.

Signs of chronic pimelea poisoning

- Chronic diarrhoea
- Loss of condition
- Poor appetite
- Rough coat
- Depression
- Prominent jugular veins in the neck
- Oedema (soft swelling) of the head, brisket and abdomen
- Increased respiration rate
- Heart beat may be heard from a distance
- Decreased ability to exercise
- Sudden death, commonly during exertion

Risk factors for pimelea poisoning

Outbreaks of pimelea poisoning can occur at any time of year, but are most common between August and December. Cases are commonly seen from the time that the plants start to flower (usually early September) until all the pimelea plant material has disappeared.

All breeds and ages of cattle are susceptible, although bulls and breeding cows appear to be at greater risk than steers, bullocks, heifers and calves. Both homebred and introduced cattle can be affected.

Pimelea plants have hard-coated seeds that can remain viable in the soil for a year or more. The seeds

germinate when night temperatures fall to 15–20°C and day temperatures are around 20–25°C. Good rain in late summer/autumn will stimulate germination and severe poisoning events are most likely to occur in years when a relatively dry summer is followed by early, light winter rain. Germination in these years is also likely to coincide with poor pasture availability, reducing competition with perennial grasses and allowing dense stands of pimelea to develop.

Generally, green pimelea plants are unpalatable, and cattle only eat them when really hungry or if they are mixed with other feed, eg when growing within tussocks of buffel grass. When the plants dry off, dry stalks, fragments and plant dust may be accidentally eaten or plant dust inhaled and then swallowed, leading to poisoning. Dry plant material can remain toxic to cattle for several years until significant rainfall breaks it down in the soil. In some cases, outbreaks of poisoning have occurred even in cattle grazing paddocks free of pimelea plants. This may be due to contamination of paddocks with plant dust blown from adjacent pastures. Alternatively, producers may fail to notice the plant when it is growing, and by the time poisoning occurs there may be no obvious plant material visible.

The incidence of pimelea poisoning often varies from paddock to paddock. Some paddocks have a much greater risk of poisoning than others, and some paddocks with abundant pimelea plants do not cause poisoning in cattle. Grazier surveys carried out on a number of properties in Queensland suggest that the risk of poisoning is greatest in paddocks with lighter, less fertile soils, particularly sandy loams and light red soils. It appears that a number of plant, soil and climatic factors combine to cause poisoning outbreaks.

Climatic conditions that increase the risk of pimelea poisoning

- Previous summer rainfall below average
- Pasture density reduced; obvious bare areas without vigorous perennial grass
- Late summer/autumn rainfall is average to above average
- Winter rainfall
- Spring is dry

Management of affected cattle

There is no specific treatment for pimelea poisoning and therefore it is very important to identify signs of an outbreak before cattle become seriously affected.

Cattle grazing paddocks containing pimelea plants should be closely observed for signs of toxicity, particularly during the high risk period between August and December.

Diarrhoea is often the first indication of an outbreak, and if this occurs cattle should be quickly moved to a pimelea-free paddock and provided with supplementary feed. Cattle should be moved carefully and quietly, as the stress of mustering can kill affected animals. Cattle usually recover slowly once they are removed from the poisonous pastures, however the likelihood of recovery is best if poisoning is identified early.

A common symptom of pimelea poisoning in cattle is loss of appetite. Gastric Stimulant Powder (Parnell Laboratories), a commercial rumen and intestinal stimulant, may help in the recovery of severely affected, emaciated cattle by re-establishing their rumen activity and appetite. It can be given as an oral drench or added to a molasses mix.

In the early 1990's, extensive research was carried out on a potential vaccine against pimelea poisoning. Toxins were isolated from pimelea plants and formulated into vaccines. Although vaccinated cattle were able to produce anti-toxins (antibodies) against the pimelea poisons, they were not protected from poisoning when exposed to the plants. Nor did vaccination speed up the recovery of poisoned cattle.

There are a number of possible explanations for the failure of the vaccine to protect cattle from poisoning. It is possible that the level of anti-toxins produced by vaccinated cattle is too low to neutralise all the plant toxins in the circulation. Alternatively, the toxins may act directly on the lungs after inhalation of plant dust or on the intestine following consumption of the plants, without the need to circulate in the blood stream. If this

is the case, anti-toxins in blood would be unable to neutralise the toxins before they caused damage.

Prevention and control of outbreaks

As mentioned above there is no effective vaccine or antidote against pimelea poisoning, despite the extensive research that has been carried out in this area.

Prevention and control of the condition therefore require careful monitoring of both cattle and pastures by producers, and the use of grazing management strategies to minimise contact between susceptible stock and poisonous pimelea plants.

The following recommendations are suggested for producers in affected regions to help reduce the incidence of poisoning and its economic consequences:

- The best management strategy is to remove affected cattle from toxic paddocks and improve their nutritional status by feeding a protein supplement. In most cases only a proportion of cattle in a mob will be affected, and animals can recover if they are detected early and removed from the poisonous plants. Yard feeding, safe paddocks or movement to another property are possible options that should be considered in any cost benefit analysis when dealing with a poisoning outbreak where only a relatively small number of animals are affected.
- Learn to identify toxic pimelea species and determine the paddocks in which they grow.
- Be aware of the climatic conditions that predispose to high risk years – ie a relatively dry summer followed by early, light winter rain.
- Monitor cattle closely for typical symptoms of pimelea poisoning, particularly between August and December. Poisoning may be suspected when loose faeces are seen at watering points.
- Keep pimelea-free paddocks in reserve so that cattle can be moved to them when poisoning first occurs.

On some properties this may not be an option.

- Lightly stock paddocks containing pimelea, as competition from a strong pasture stand may make it more difficult for the plant to spread. Remember that poisoning can still occur when paddocks are lightly stocked.
- If necessary, graze affected paddocks while pimelea plants are green. Green pimelea is unpalatable to cattle. Poisoning can still occur if cattle inadvertently eat green plants in overgrazed paddocks or where pimelea grows closely with other pasture species, such as buffel grass.
- Where possible, graze affected paddocks with sheep rather than cattle when pimelea is present.
- If affected paddocks must be grazed by cattle, select less susceptible animals such as steers, bullocks, heifers and calves, rather than bulls and breeding cows.
- Ensure that pasture seeds such as buffel grass are free from pimelea seeds, to avoid dissemination of the plants.
- Avoid disturbing soil in paddocks with pimelea, as soil disturbance promotes seed germination and plant growth.
- Burning has been used to control pimelea on some properties; however, on others, burning has actually increased the population of the plant. It is suggested that one fire in late winter/early spring could be used to kill pimelea plants and break their hard seed coats. That burn should then be followed in the next or later years by a second fire when fresh young plants are observed. This may be sufficient to reduce the potential population of pimelea to nonthreatening proportions.

The bottom line

Pimelea plants are native to Australia and therefore biological control is unlikely to be successful. Pimelea poisoning is a complex condition that occurs sporadically in regions where toxic varieties of the plant grow. Poisoning outbreaks appear to be due to a combination of climatic, soil, pasture and animal factors. Grazing management and soil disturbance are major reasons for the increased presence of pimelea in natural pastures over time. The disease itself has increased in recent years because there are now more cattle being grazed in what was predominantly sheep country. At the present time there is no specific treatment for pimelea poisoning, and management strategies to reduce contact between toxic plants and susceptible stock are the only option open to cattle producers to avoid potentially devastating poisoning events.



Level 1, 40 Mount Street,
North Sydney NSW 2060
Tel: +61 2 9463 9333
Fax: +61 2 9463 9393
www.mla.com.au

2nd edition, published June 2016
ISBN: 1 74036 018 4
© Meat & Livestock Australia
ABN 39 081 678 364