



## **Drought Recovery Guide, Third Edition October 2005 - Readers' Note**

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<http://www.dpi.nsw.gov.au/agriculture/drought-bushfire-emergencies/drought/recovery/drought-recovery-guide-2005>

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# Dryland summer grain and forage crop opportunities

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Depending on the longevity of the drought, many growers may be looking for summer grain or forage crop options for cash and to maintain animal performance and replenish fodder supplies. This article highlights the major considerations when choosing a summer crop for a given paddock. It is designed to prompt questions rather than provide all the answers. Each paddock will be different.

This information is a summary only. More detailed information is available from [www.dpi.nsw.gov.au/agriculture](http://www.dpi.nsw.gov.au/agriculture). The summer crop budgets can be found on the NSW Department of Primary Industries web page ([www.dpi.nsw.gov.au/agriculture/budgets](http://www.dpi.nsw.gov.au/agriculture/budgets)) and information is also available from NSW DPI district offices.

As with any season, successful summer crops will depend on good agronomic management. The following are some of the considerations:

- **Stored soil moisture** – carefully check the level of stored soil moisture. It may be better to fallow the paddock through to a winter crop, rather than risk planting on marginal moisture.
- **Level of experience** – there are considerable risks associated with growing a crop for the first time. Do not grow large areas unless you have previous experience with the summer crop selected. New crops can be risky and have large variable costs. Another consideration is how the crop fits your current rotation. Consider joining a farmer group or developing a learning partnership with an agronomist and increase the area grown over time.
- **Markets and prices** – an evaluation of the market prospects is a key part of the crop selection strategy. Crop prices can fluctuate dramatically.
- **Residual herbicides** – many paddocks that were aimed for winter crop this year will have had pre-sowing residual herbicides applied (such as Group B sulfonyl ureas) which will prevent the sowing of most summer crops.
- **Soil nitrate** – crops such as maize, cotton and sorghum require significant levels of available N. Summer legume crops, however, do not. Summer legumes planted into paddocks with high available N (for example, where N was applied but not used by a winter crop) will have reduced N fixation.
- **Insect Control** – for most summer crops, insect control is vital and requires a significant level of monitoring.
- **Overall rotation** – although there is pressure to generate cash flow by planting summer crops, maintaining a balance of winter and summer crops in the rotation is the key to risk management in the north.
- **Level of Risk** – summer cropping is considered riskier in western (especially south western) parts of the region. This risk can be partly compensated by good levels of stored soil water.

## SUMMER FORAGE CROPS

- **Forage sorghum** – the most productive and fast growing forages for grazing, hay and silage, particularly for large animals. Check sowing guides for agronomy but sowing can take place in most districts when the threat of frost has gone and soil temperatures have reached at least 16°C at seeding depth at 9 am. Careful grazing rules should apply as stressed crops or rapid regrowth can produce prussic acid and/or high nitrate levels, leading to animal fatality.
- **Millet** – has less dry matter production than forage sorghum but higher quality feed for smaller animals such as sheep. It can be more difficult to establish than the larger seeded sorghums. Fewer herbicide options are available for weed control.
- **Cowpeas** – high quality forage, particularly suited to lighter textured soils. As a legume cowpea has an advantage over the grass forages for nitrogen requirements.

## SUMMER CASH CROPS

- **Grain sorghum** – the most diverse and productive summer grain crop provided soil, water and nutritional requirements are met. Grain sorghum performs particularly well on the heavier clay soils with high moisture storing capacity. Nitrogen fertiliser and weed control management are very important.

Grain sorghum is well suited to no-till technology. Stubble also has some grazing value.

- **Sunflower** – oilseed sunflower is a more specialised crop requiring more detail to both marketing and agronomy. Prior to planting consult local grain traders for contractual advice. Precision planting equipment is almost essential. Sunflowers have no grazing value.
- **Maize** – a much more specialised grain crop for the higher rainfall areas of the slopes and tablelands. A productive and high feed value crop for both grain and silage under irrigation.
- **Cowpea, mungbean, soybean** – as grain crops these legumes are for specialised high quality markets. Obtain marketing advice before growing these crops as a quick cash alternative. Attention to detail is required in planting, weed control, harvesting and marketing.

Seed supplies of many of these crops are often in short supply following drought. It is wise to order seed promptly once you have made a decision.

## Tree management after drought

### ALWAYS READ THE LABEL

Users of agricultural (or veterinary) chemical products must always read the label and any Permit before using the product, and strictly comply with the directions on the label and the conditions of the Permit. Users are not absolved from compliance with the directions on the label or the conditions of the Permit by reason of any statement made or not made in this publication.

Strategically-located farm trees and native vegetation improves agricultural production, protects soils, water and wildlife, and improves the capital value of rural properties. Droughts generally have the effect of favouring some trees and shrubs while adversely affecting others. Landholders can then observe which trees have performed best in their areas and incorporate good tree management practices into their property management plan and drought-managing strategy.

### RECOVERY OF MATURE Paddock TREES

In many areas, mature paddock trees will have suffered in the drought due to increased pest attack and moisture stress. To promote recovery of these trees:

- avoid cultivation close to the root zone;
- avoid fertiliser application close to the root zone;
- observe trees for subsequent pest damage and control, where necessary.

Mature trees can be adversely-affected by repeated pest damage, particularly where one-third or more of the leaf area is reduced. Injection of insecticide may be warranted when pest attack is severe. Easing the conditions that lead to tree stress (high nutrient levels, damage to roots, soil compaction, and over-clearing) is the most effective way of improving tree vigour and health.

## RECOVERY OF TREES AND SHRUBS LOPPED FOR FODDER

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### NOTE

Landholders are advised to contact their local relevant government department for the latest regulations concerning the lopping of trees.

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Where trees and shrubs have been lopped for fodder, it is vital to allow their full recovery before subsequent lopping. For some trees, such as kurrajongs, this may take 4–5 years.

For scrub areas, reduce or eliminate grazing to allow scrub to grow back

Continued lopping can reduce the lifespan of a tree. When planning for future farm tree plantings, aim to replace or increase the number of fodder trees.

## MANAGEMENT OF EXISTING NATIVE VEGETATION AREAS

### Establishing native tree seedlings by natural regeneration

Many native plants respond to drought by flowering and setting seed. A break in the drought will often favour establishment of trees and shrubs by natural regeneration. This provides a very low-cost method of increasing and maintaining native vegetation areas. For best results use the following guidelines.

- Exclude grazing from native vegetation areas, especially while young plants are getting established.
- Fence-out areas around clumps or individual trees. Seed will fall up to 50 m from the trunk of large trees, falling mostly in the direction opposite prevailing winds. Orientate the fenced area to coincide with this pattern.
- Develop natural regeneration areas where they provide the best shade and shelter advantages.
- Control feral and pest animals, such as rabbits, which typically graze on young seedlings.
- Monitor native vegetation areas for weed growth. Exotic pasture and weeds can out-compete native plants, especially at the seedling stage. Reduce the weed seed bank in the soil – this can be achieved by spot-spraying with a knockdown herbicide.

- Be patient. Some trees require months or even years to set seed after flowering.

Following the establishment of native trees and shrubs, continue to restrict or eliminate grazing until they are above browsing height and the stems are sufficiently thick to withstand rubbing by livestock.

### Maintenance of young trees and existing plantings

Where young trees and existing plantings have suffered during the drought:

- Replace losses while the surrounding trees are still small – establishing seedlings among semi-mature trees is difficult due to competition for moisture and nutrients.
- Ensure good weed control.
- Monitor pest damage and control as required.



*Fencing off areas of regenerating bushland on your farm will allow trees and shrubs to grow to their full potential, which will benefit livestock, soils and wildlife.*

## PLANNING FOR NEW PLANTINGS

Identify which trees and shrubs, and which layouts of trees and shrubs, have survived in the drought. For example, choose the trees that have maintained a full canopy and resisted pest attack, the blocks or belts of trees that have given good wind protection, and the trees that have provided the best fodder reserve.

- Aim to include these findings in your farm tree plan.
- Keep a record of the trees and shrubs which survived best in the drought. Collect seed from trees and shrubs which have shown

superior vigour under drought conditions. Of particular value for windbreak plantings are tall trees with low foliage, and small-to-medium dense shrubs.

- Consider how new plantings can link with existing plantings or bushland areas to provide wildlife corridors.
- When redesigning or maintaining farm infrastructure (farm access tracks, fences), include opportunities for planting farm trees.
- For grazing enterprises, increase perennial fodder sources such as saltbush, fodder trees and tree lucerne.
- Prepare for future droughts by maintaining and increasing windbreaks orientated against the worst prevailing winds.

## ASSISTING RECOVERY OF NATIVE WILDLIFE

To foster the recovery of native wildlife on the farm:

- retain and manage native vegetation areas, particularly near watering points;
- retain dead or dying trees for native wildlife habitats;
- control pests and feral animals such as foxes and cats.

## FURTHER INFORMATION

### NSW Department of Primary Industries publications

- *Plan for Trees – A guide to farm revegetation on the coast and tablelands*

### ‘Trees on Farms’ home study course

The ‘Trees on Farms’ home study course, available from Murrumbidgee College of Agriculture, is aimed at providing a basic understanding of the role and function of trees on your farm. Topics include:

- Farm productivity and trees
- Getting trees on the farm
- Types of tree production
- Commercial tree products.

### Nature Conservation on Farms

The publication *Nature Conservation on Farms* is produced by NSW Department of Primary Industries, Farming for the Future, and the Australian Nature Conservation Agency. This practical guide is available for purchase from NSW Department of Primary Industries’s CB Alexander College, ‘Tocal’.

### National Parks and Wildlife Service

National Parks and Wildlife Service has free brochures on native animals and plants including:

- *Native Animals and the Landholder*, which has information on the *Threatened Species Conservation Act 1995* and how it affects rural landholders;
- *Remnant bushland – quality assessment and management guidelines*.

# Controlling vertebrate pests after a drought

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Population levels for most species of vertebrate pests can be severely affected by prolonged drought. Low breeding rates and high infant mortality are common responses of species such as feral pigs and kangaroos. Feral goats, though, have the potential to 'hang on' for longer because they can browse shrubs. Rabbits living in country that has a lot of seed in the soil, particularly clover or medic seed, are also able to survive and actually continue to breed well into the drought. However, once this feed source is exhausted, the population can suddenly crash. This crash in the rabbit population will normally be quickly followed by a reduction in the fox population. This is unless there is alternative food, such as lambs, native animals, or carrion. All pest species respond to the breaking of a drought by increasing their body weight and by beginning to breed. It is the potential rate of increase in a pest animal population that is of critical importance to decision-making when planning a management strategy for vertebrate pests.

## PEST POPULATIONS AFTER A DROUGHT BREAKS

### Mice

Populations of small vertebrate pests such as mice have the potential for a huge increase if the breaking of drought provides them with an abundance of food and shelter. Drought can also reduce the numbers of predators that would otherwise help control mice. Mice that survive natural phenomena such as drought are the strongest and fittest of the population. They respond by rapid breeding, often resulting in populations of plague proportions. A single pair

of mice has the potential to multiply to many hundreds over a six-month breeding period.

### Rabbits

Rabbits are the next most prolific species, but because they take longer to reach breeding weight and have longer pregnancies and smaller litters, they do not have the spectacular population explosions seen with mice. Nevertheless, a single pair of rabbits may produce, through their own mating and the mating of their offspring, up to 40 rabbits over a six-month period.

### Feral pigs

Feral pigs are much less prolific breeders than rabbits. Nevertheless, a pair of feral pigs has the potential to produce about six young over a six-month period. If feral pig numbers are reduced by drought and the reduction is followed-up by properly conducted control programs, pig populations can take many years to build back up.

### Wild dogs

Wild dog populations may decline during extended droughts, especially if there is a drastic decline in their preferred prey such as kangaroos and wallabies. However, this does not necessarily reduce predation on sheep because hungry wild dogs will sometimes move from bushland to adjacent grazing land in search of alternative prey.

If wild dog populations have declined during a drought and survivors have not moved onto grazing lands, there may be less predation for a time. However, landholders should remain vigilant, particularly in autumn and winter when dogs usually disperse.

Young inexperienced dogs will often disperse, regardless of food availability, from their parents' home range.

### Foxes

Fox populations generally remain relatively static during extended droughts, especially if there is a supply of carrion such as lambs, kangaroos and wallabies. In many instances foxes will turn their attention to insects such as the Australian Plague Locust to sustain themselves. However, this alternative food supply does not necessarily reduce lamb predation as foxes will increase their territories in search of alternate prey.

If fox populations do decline during a drought and juveniles do not disperse rapidly, then

there is a potential for much more localised predation of lambs and poultry. Landholders should always remain vigilant, particularly in autumn and winter when young foxes are usually dispersing or older females are breeding. Young, inexperienced foxes will often disperse regardless of food availability in their parents' home range.

A baiting program is usually inexpensive and can be carried out in early autumn (to reduce breeding animals) and a follow up in late winter to reduce pregnant females. Your local Rural Lands Protection Board ranger can assist with a baiting program and supply baits.

### Other species

Other species such as feral goats and kangaroos increase their populations much more slowly after drought.

## CONTROL STRATEGIES

The critical point to remember in vertebrate pest control is that if the pest population is already low and can be made lower by tactical control, this will generally be a good investment because the recovery rate of the population is much slower. For maximum benefit, this requires a coordinated approach by all landholders and land managers, otherwise pests will simply

breed-up and immigrate from neighbouring properties.

Drought can also severely reduce the number of predators in a system with predator populations usually taking longer to recover than their prey. This means that many pest species can breed with few constraints once good seasons return, so populations can increase extremely quickly.

### Feral pigs

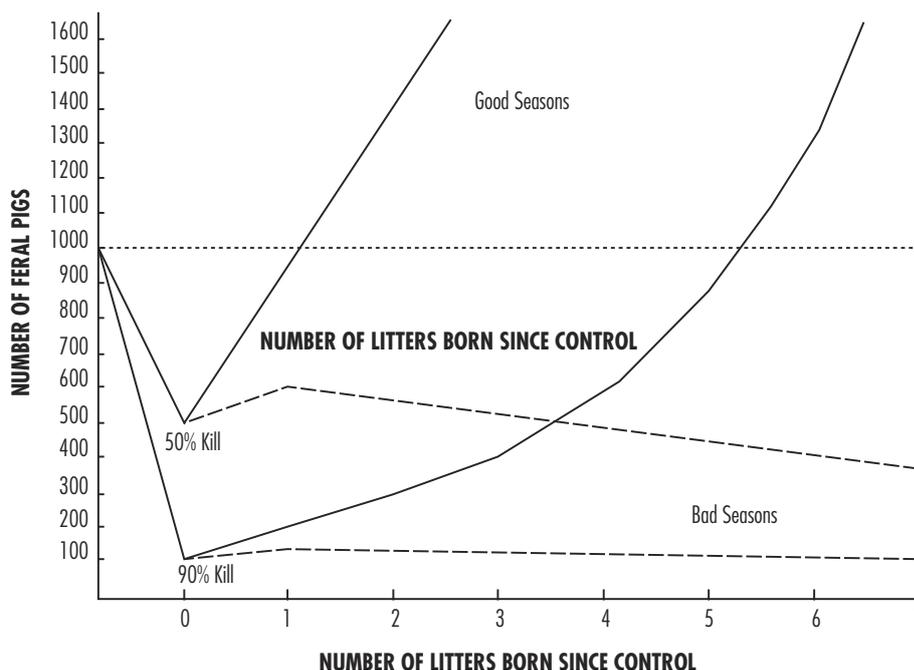
Figure 3 demonstrates the different recovery rates of feral pig populations that have been reduced by 50 per cent and 90 per cent. In good seasons, a population experiencing a 50 per cent kill will recover to the original levels within 12 months, whereas a population experiencing a 90 per cent kill will take five years to recover. This principle applies to all wild animal populations.

### Rabbit control and feed

See the advice above regarding the labels and permits concerning the use of chemical products.

Remember this simple rule of rabbit control: best results with rabbit poisoning programs are obtained when feed is short. Therefore, if you are still in a drought area, poisoning with 1080 bait will give a far greater reduction. However, if plenty of green feed is present, this feed will be a more attractive alternative to the bait and, consequently, the poisoning program will not be

**Figure 3. The change in numbers of feral pigs in good and bad seasons following 50 per cent and 90 per cent control kills**



Source: Hone, O'Grady & Pederson 1980, *Decisions in the control of feral pig damage*, Ag Bulletin No. 5, NSW Agriculture.

as effective. In these circumstances, other options such as ripping or fumigating warrens should be considered.

Trapping is seldom used for broad-scale rabbit control and it should be noted that only soft-jawed traps are permitted. The older-style steel-jawed traps are now illegal in NSW.

Those areas that have had plenty of rain and have moderate to high rabbit densities may be fortunate enough to experience a virulent myxomatosis or calicivirus outbreak. This should not be relied on, though, because it is impossible to predict the timing or effectiveness of any outbreak.

### **Wild dogs**

It is good management to increase monitoring for wild dogs during droughts and after fires so that control measures can be implemented before predation of livestock becomes a major problem. Wild dog management plans should cover this contingency, but in any case, monitoring and control of wild dogs is best done by groups because the movements of wild dogs usually extend over several properties and adjacent bushland. Coordinated precautionary baiting or trapping programs may also be useful along routes traditionally used by wild dogs.

There are strict regulations governing the poisoning of wild dogs. Poisoned baits may only be prepared by authorised rangers of your local Rural Lands Protection Boards. Advice on control and group efforts is also available from rangers.

Trapping is best conducted by experienced trappers using soft-jawed traps that conform to legal requirements.

## **LONG-TERM EFFECTS**

As with all management decisions, controlling the long-term effects of pest control is crucial. Ensure that the decisions made enhance the long-term sustainability of your property and contribute to the protection of the native animals and plants that play an important part in making your area a pleasant place to live. Balancing these decisions is an important component of your property management plan.

## **COOPERATION OF NEIGHBOURS**

Most vertebrate pests range over large areas. When considering pest animal control on your property, consider a larger area than your property alone. Try to get a group of neighbouring properties to work together for a more lasting effect. Rangers with your local Rural Lands Protection Board can organise a group control program, provide information on planning, monitoring, free feeding, poisoning and other control strategies.

## **FURTHER INFORMATION**

- Agfact A9.0.17 *Foxes and their control*

## **FURTHER ASSISTANCE**

Further assistance is available from:

- Agricultural Protection Officers through your local office of NSW DPI;
- Rangers through your local Rural Lands Protection Board.





NSW DEPARTMENT OF  
PRIMARY INDUSTRIES

## Section 3

# Animal health

- **Animal health following drought**
- **Bloat**
- **Enterotoxaemia in cattle**
- **Prussic acid poisoning**
- **Nitrate and nitrite poisoning of livestock**

# Animal health following drought

## DISCLAIMER

The product trade names in this publication are supplied on the understanding that no preference between equivalent products is intended and that the inclusion of a product does not imply endorsement by NSW Department of Primary Industries over any other equivalent product from another manufacturer.

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The transition from drought is an important time to be concerned about livestock health. Even though the drought may appear to have broken, there is no time to relax on matters that concern livestock health. More care and attention needs to be given both to your current stock and to any newly-purchased stock.

With the advent of drought-breaking rains, the feed and water supply situation may dramatically change. A comment often made by graziers is that they managed to keep their stock alive through the drought only to suffer losses when the drought broke. Bloat, pulpy kidney, plant poisonings and hypothermia are among the most common problems causing deaths at the end of a drought because, at such times:

- stock may be in poor condition;
- stock may have become accustomed to eating restricted quantities of unusual types of feed;
- water supplies may be restrictive in terms of quantity and quality;
- stock are not accustomed to eating green forage, especially lush grasses and clovers;
- stock may be suffering from long-term vitamin and/or mineral deficiencies;

- the usual disease prevention measures, such as vaccination or worming, may not have been given.

## POTENTIAL PROBLEMS FOLLOWING DROUGHT

### Cold, wet and windy weather

Adverse weather conditions are frequently associated with drought-breaking rains. Even in the middle of summer, extreme cold weather conditions can be experienced, and stock in poor condition can be highly-susceptible. Poor body condition, poor or inadequate feed, lack of shelter, an interruption to provision of supplementary feed, and recent shearing, are just some of the factors that can contribute to a disaster.

Therefore, be alert to weather changes and ensure that susceptible stock have access to shelter. Bring forward supplementary feeding if there is any chance that feeding may be interrupted as a result of rain. Sheep that have been recently-shorn are the most susceptible, especially if they are in poor condition. You may need to keep them in sheds, or confine them to small paddocks with feed and shelter.

### Water

If sufficient rain falls to replenish surface water supplies, the surface run-off may carry excessive amounts of livestock manure into the water storage, making it unacceptable or even dangerous to stock. This can be avoided by restricting stock access to these water supplies. You may need to pump water to troughs or tanks from an area of the storage that is relatively-free of the contamination (the contamination tends to accumulate around the edge of the water).

See *Reassessing water requirements after a drought*.

### Feed

Initially, a 'brown' drought can become a 'green' drought with the newly-germinating plants not contributing significantly to the nutritional needs of stock (see *Grazing management following drought*). Stock, especially sheep, can therefore waste precious energy 'chasing the green pick' if drought-feeding is stopped too soon.

Following the rain, therefore, continue with the usual drought feeding regime until the feed really comes away. Then, progressively reduce the supplementary feed over about two

weeks. In this way, the major nutritional upsets associated with a sudden change in feed (such as enterotoxaemia or pulpy kidney) can largely be avoided.

## Feed changes

As mentioned above, sudden changes in the amount or type of feed can have disastrous consequences. Major problems can relate to digestive upsets and plant poisonings. Avoid these problems by allowing stock a **gradual transition** between feed types, such as limiting access to the pasture to an hour or two each day, then gradually increasing the amount of time until they can be left on the pasture permanently.

**Never, ever, put hungry stock in a fresh paddock.** In these circumstances, the stock will indiscriminately gorge themselves on the first available feed, often leading to poisonings or digestive upsets. Instead, pre-feed with hay, restrict daily access, or provide access to a safe, preferably mature grass paddocks to overcome the hunger before allowing access to rapidly growing, lush 'different' feed.

## Bloat

Rapidly-growing legumes, such as lucerne, clovers and medics, frequently cause bloat, especially in young cattle.

If pastures contain a significant amount of legume, bloat protection is an absolute must. A variety of techniques exist, including the use of:

- bloat capsules;
- pasture sprays with anti-bloat preparations;
- bloat blocks;
- bloat oils mixed with supplementary feed.

See more detailed information later in this guide.

## Grass tetany

Grass tetany can be regarded as a deficiency of magnesium and most frequently affects breeding cows grazing grass-dominant pastures in winter. It is usually associated with cold, wet weather and mainly affects cows in late pregnancy and early lactation. Unfortunately, the first sign is often sudden death, sometimes affecting significant numbers of cattle.

Magnesium supplements, in the form of blocks or as treated oats or hay, are recommended for prevention.

Coming out of a drought, it is likely that both breeding cows and ewes will be more prone to magnesium deficiencies.

For further information, see Agfact A0.9.29 *Grass tetany in cattle* and Agfact A0.9.59 *Grass tetany in cattle – treatment and prevention*.

## Vaccination

Stock should be brought up to date with their vaccinations if any have been missed during the drought.

In particular, a booster dose of pulpy kidney vaccine is recommended for both sheep and cattle. This is because the protection afforded by vaccination may only last for three months after a booster dose of vaccine. Sudden changes in the amount and type of feed available exposes both sheep and cattle to a very high risk of developing pulpy kidney.

See also the sections on Leptospirosis and Brucellosis in rams and Vibriosis in cattle.

## Blowflies

Because of the prolonged dry weather, most sheep will not have been given a preventive fly treatment. In addition, in order to minimise stress on stock during drought, many lambs may not have been mulesed. If the weather stays warm following the rains, all the factors are present for a fly problem to develop.

Susceptible sheep should be protected by jetting using Cyromazine (such as: Vetrazin<sup>®</sup>, Jetcon<sup>®</sup>), giving up to 14 weeks' protection. Adding an organophosphate (OP) insecticide is not recommended, because an OP insecticide increases the risk of residues in wool and does not provide any extra protection. Where possible, fly-struck sheep should be separated, the strike treated, and a preventive jetting applied (see Agnote DAI-72 *Hand jetting sheep*).

## Sheep worms

Through a drought, sheep worm eggs tend to accumulate because there is insufficient moisture to permit them to hatch normally. This, coupled with relatively higher stocking densities where sheep have been hand fed, can lead to the build-up of a large reservoir of worm eggs. After rain, there can be a mass hatching of eggs, and stock can be exposed to a severe worm challenge. Also, at the end of a drought, there is often very little choice of paddocks, and stock may need prolonged protection.

In the warmer months, barber's pole worm can cause problems (anaemia, ill-thrift and death) in as little time as 3–4 weeks. Most barber's pole worm drenches are short-acting, but one, Closantel, keeps killing barber's pole worms for

up to six weeks. This is very useful if you can't turn sheep onto a fresh paddock after drenching. Closantel is marketed as Seponver<sup>®</sup> and Razar<sup>®</sup>.

If the normal drenching program has not been carried out during the drought, it is wise to catch up as soon as possible. Seek advice from your local veterinary adviser on the best worm control programs to suit your area.

## PURCHASING STOCK

There is always a risk of introducing diseases with any purchased stock. If possible, be selective in the stock you buy and make sure they appear to be in a satisfactory state of health. Obtain as much information as possible about the health, vaccination and recent treatment (for lice, worms) of the stock. The vendor should be prepared to provide this information – a reluctance to do this may suggest a potential problem with the stock.

When restocking, it is wise to contact your Rural Lands Protection Board veterinarian in order to check on the disease status of the areas of origin of your new stock.

On arrival, stock should be isolated from existing stock for at least 2–3 weeks and inspected daily. During this time, any necessary treatments or vaccinations can be applied to bring the new stock up to the same standard as your current stock.

## HEALTH CONCERNS WITH PURCHASED STOCK

### Worms in introduced stock

There is no way to easily determine the drench resistance status of worms in purchased stock, so it is recommended that you drench new stock with any highly effective combination of three, preferably four, unrelated drenches, e.g. Benzimidazole + Levamisole + Macrolytic lactone. There are drench products on the market that make this easy which are ready made combinations of drenches and also drenches which can be mixed with other drenches. Follow the directions on the label. If necessary, a fluke drench may also be given. See Agnote DAI-257 *Quarantine drenching – don't import resistant sheep worms* for more information

Hold sheep (with access to water) for at least 24 hours after treatment before release onto contaminated pasture. Ensure access to feed as

well as water if NAP (Rametin<sup>®</sup>, Combat<sup>®</sup>) is used.

### Footrot

Footrot is the last disease you want to introduce onto your property. If you are purchasing sheep, make sure they are inspected and are free of any lameness. You should also ask the vendor for a footrot vendor declaration – it is a safeguard against the introduction of the disease. Where possible, buy sheep from properties in the Footrot Control Areas and Protected Areas of NSW. It is a legal requirement to obtain a footrot vendor declaration and supply it to the local Rural Lands Protection Board if you are introducing sheep into a Footrot Control Area or Protected Area from a Residual Area.

Any sheep that develop lameness should be investigated immediately. Both footrot and foot abscess can develop under similar lush pasture conditions, and it is often difficult to determine which disease is present. If you are unsure of the cause of any lameness in sheep, get advice from your local District Veterinarian or private veterinary practitioner. Act quickly to prevent spread of the disease.

### Sheep lice

Lice are always a risk when buying sheep. With around 20 per cent of flocks infested, inspect sheep well before introducing them onto your property.

It is difficult to detect lice on sheep that have less than three months' wool, even if they have not been treated after shearing. Remember, even if you can't find lice in short wool, the sheep could still be infested. Keep them isolated from other sheep for as long as possible, and re-inspect them for lice frequently. If lice are detected, consider your options:

- Keep the sheep isolated until the normal flock shearing, and treat after shearing

OR

- Treat the sheep immediately, using a product suitable for application to long-wool sheep. Maintain them separately until shearing, and treat again after shearing. Long-wool lice treatment is unlikely to eradicate lice – it will just control them until shearing.

OR

- Keep sheep isolated, shear as soon as possible, and treat after shearing.

## Johne's disease

Johne's disease causes wasting and death. It can affect both cattle and sheep. The strains of the bacteria causing Johne's disease in cattle rarely affect sheep, and vice versa. But there is a risk, and because it is very difficult to eradicate the disease, it is best to keep Johne's disease at bay.

When buying cattle, especially from the wetter southern areas, ensure you obtain a vendor declaration in respect of Johne's disease. See *Bovine Johne's Disease Protected Zones* for information on cattle movements between zones of different status. When buying sheep, producers should always request an Animal Health Statement to assess the risk of buying sheep with OJD. An Animal Health Statement is mandatory for the sale of restocker sheep. Producers should check with their local Rural Lands Protection Board for the requirements for their region.

## Leptospirosis

Leptospirosis is another bacterial disease that is often associated with wet conditions. It is important because of its ill-effects on both cattle and people. Protecting cattle by vaccination also reduces the risk of infection in people working with the cattle.

Leptospirosis vaccines for cattle are now available either combined with clostridial disease vaccines (Cattlevax<sup>®</sup>, Vaxall Clepto-7<sup>®</sup>, Vaxicare Cattlemaster 7<sup>®</sup>, 7-in-1 for Cattle<sup>®</sup>), or as straight dual leptospirosis vaccines (Lepto for Cattle<sup>®</sup>, Vaxicare Lepto HP<sup>®</sup>, Leptovax<sup>®</sup>).

## Brucellosis in rams and vibriosis in bulls

Both of these sexually-transmitted diseases can have a major impact on the reproductive performance of the flock or herd.

Buy only those rams that are from flocks accredited free of brucellosis, even if rams are hard to source. Accredited-free flocks will have a certificate which will show an accreditation expiry date. Introducing infected rams will result in a poor lambing performance and will spread the infection to other rams.

Bulls can be carriers of vibriosis, which can reduce calving rates by as much as 20 per cent, sometimes more. It is a wise precaution to determine the disease status of the herd of origin before purchase and to vaccinate all bulls on arrival before they are used; many producers are unaware that their herds are infected.

## HGPS AND RESIDUES

When purchasing stock, especially those that you will sell at a later time, it is important to obtain information about their HGP status and residue status, as this will influence your subsequent marketing decisions.

Residues are usually not a problem, although the feeding of cotton trash and stubble to cattle in the 1994 drought did result in chlorfluazuron (CFZ, Helix<sup>®</sup>) residues in some situations. Once again, the only protection is to obtain a vendor declaration of freedom from CFZ residues when purchasing cattle.

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# Bloat

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## What is bloat?

Bloat is a risk when animals are grazing young, lush pasture, particularly if the pasture has a high legume content (clover, medics or lucerne). Ruminant animals produce large volumes of gas during the normal process of digestion. This gas either is belched up or passes through the gastrointestinal tract. If something interferes with gas escape from the rumen, bloat occurs.

Natural foaming agents in legumes and some rapidly growing grasses cause a stable foam to form in the rumen. Gas is trapped in small bubbles in this foam in the rumen and the animal cannot belch up the gas. Pressure builds up in the rumen causing an obvious swelling on the left side of the body.

## Signs of bloat

Cattle with bloat may display the following signs:

- distended left abdomen;
- no longer grazing;
- a reluctance to move;
- appear distressed – vocalise, eyes bulging;
- strain to urinate and defecate;
- rapid breathing – mouth may be open with tongue protruding;
- staggering.

In **advanced cases** the animal will go down. Death is rapid at this stage, and is due to the swollen rumen compressing the lungs, interfering with breathing and tissue oxygenation, and obstructing blood flow.

## Treating cattle

### Early/mild cases

Animals that are mildly affected can be treated orally with an anti-bloat preparation. After dosing, keep the animal moving to encourage the preparation to mix with the frothy rumen contents.

### Moderately affected stock

Animals that are bloated and starting to show signs of distress need veterinary attention. A stomach tube can be used to relieve the gas build-up. Anti-foaming agents can be delivered

directly into the rumen through the tube. Moving the animal around after treatment is important.

### Severe cases

Animals that are severely bloated and distressed need rapid relief. This may be achieved by inserting a wide-bore trochar and cannula into the rumen high on the left flank (where the swelling is greatest). After gas and froth is released, an anti-bloat preparation is poured through the cannula into the rumen to help break down remaining froth/foam (dose according to label instructions – see 'Always read the label'). In emergency situations, vegetable oil (250–500 mL) or paraffin oil (100–200 mL) has traditionally been used.

In most cases of frothy bloat, a trochar and cannula will not be adequate to relieve pressure, and a 10–20 cm incision will have to be made using a clean, sharp knife. It may be necessary to scoop the frothy material out of the rumen by hand. In these emergency cases there is usually no time to wait for a vet to arrive, so stock owners will have to do this themselves. Veterinary attention is necessary to irrigate the abdominal cavity, clean and stitch the wound and give antibiotic treatment to prevent serious infection.

## Bloat in sheep

Bloat does occur in sheep but is less severe than in cattle. Bloat in sheep often occurs with enterotoxaemia (pulpy kidney), so it is wise to vaccinate against clostridial disease (5-in-1) before sheep go out onto lush pasture or when bloat occurs in the flock.

### Treating sheep

Treatment for sheep is the same as for cattle. At present only Tympanyl is registered for use in sheep. Traditional treatments include drenching with 50–60 mL of vegetable oil or paraffin oil. An oil or surfactant anti-bloat preparation registered for cattle may be used under written veterinary recommendation, usually at one-fifth of the cattle dose. Because sheep are small, it is possible to sit them on their hindquarters and massage the rumen to mix the oil and encourage belching. Emergency incisions into the rumen are rarely necessary.

## PREVENTION

When pasture is considered risky, **bloat prevention options** include the following:

- Restrict pasture intake by limiting grazing time or implementing strip-grazing.
- Fill animals on hay before turning them onto pasture.
- Spray the pasture daily with pasture oil.
- Drench each animal twice daily with an anti-bloat preparation or oil.
- Apply anti-bloat preparations twice daily onto the flank.
- Add bloat oil into the water supply.
- Use anti-bloat blocks or licks.
- Use anti-bloat capsules such as Elanco Rumensin Capsule.
- If hand feeding each day, add liquid bloat preventatives or products containing monensin to the feed.

## Products available for bloat control and treatment

**Table 4. Animal treatments – cattle**

Product	Description	Dosing instructions
BP bloat-ease	Liquid paraffin oil.	May be used as a drench (130 mL/head), or added to feed (100 mL/head), or applied to the flank twice daily.
Coopers Teric bloat liquid	Alcohol ethoxylate teric	20–40 mL/head/day for prevention. May be added to feed with molasses or added to water (40 mL/15 L).
Bloataway preventative bloat drench	Alcohol ethoxylate	20–40 mL/head/day for prevention.
Tympanyl	Contains emulsifiers, surfactants and oil-plant extract.	350 mL (cattle), 170 mL (sheep) as treatment for clinical bloat.
Bloat rid	Contains animal, mineral and vegetable oils.	60–113 mL/head as a drench, flank dressing or pasture spray.
Nutrimol Bloat Master water-soluble bloat treatment and preventative	Blue water-soluble liquid. May be used in water troughs, over feed, or in a drench gun.	For relieving clinical bloat, 25 mL is mixed with 200–300 mL warm water and given as a drench. For prevention, 5–12 mL on feed twice daily.
No-Bloat	Topical solution/suspension containing mineral and animal oil. May be applied to the flank or used as a pasture spray.	Flank application 60 g twice daily. Pasture spray 85 g/head/day.
Bloatenz oral	Alcohol ethoxylate drench. May be added to water.	7–25 mL/head for prevention.
Bloat-Drench oral bloat control	Alcohol ethoxylate drench. May be added to water or molasses.	21 mL/head (to 42 mL/head in extreme risk situations) twice daily for prevention.
Bloatac oral liquid	Alcohol ethoxylate drench	Mixed with water 1:4. 28 mL of mixed solution twice daily for prevention. For relief of bloat, 25 mL is mixed with 200–300 mL warm water. This product may be added to water troughs.
Bloatex	Mineral and vegetable oil. May be used as a drench, flank application or pasture spray.	Drench 113 mL/cow. Flank application 60 mL/head twice daily. Pasture spray 85 mL/head/day.

## Products containing monensin

Monensin changes the ratio of volatile fatty acids produced in the rumen. Its main use is to improve feed efficiency. It also decreases rumen methane gas production and reduces the amount of stable foam produced during rumen fermentation, therefore it can be used to prevent bloat.

### Important notes:

- **Monensin is extremely poisonous to dogs, horses and other equines.** Ingestion may be fatal. Care must be exercised to avoid accidental ingestion of monensin by these species.
- An **overdose** of monensin is **toxic to cattle.** Depending on the amount consumed, the signs of toxicity are:

- decreased feed intake
- poor growth
- depression
- death.

It is essential to follow label directions and accurately measure out the amount of monensin to add to feed on a weight basis. Thorough mixing and even distribution throughout the feed is essential.

- Never use monensin premix in combination with Elanco Rumensin capsules.
- If dosing cattle with Elanco Rumensin capsules in hot weather it is important to keep the capsules cool.

**Table 5.**

Product	Description	Dosing instructions
Elanco Rumensin Capsule	Rumen capsule. Decreases rumen methane gas production.	1 capsule per animal at least 7 days before grazing risky pasture. Lasts approximately 100 days.
Moneco 100; Moneco 200	Used as an additive to feed. Must be thoroughly and evenly mixed throughout the ration.	For prevention of bloat, use at a rate of: 25–33 mg/kg of feed for beef cattle, and 11–18 mg/kg of feed for dairy cattle.
Elanco Rumensin 20; Elanco Rumensin 100; Elanco Rumensin 200	Used as an additive to feed. Must be thoroughly and evenly mixed throughout the ration.	For prevention of bloat, use at a rate of: 25–33 mg/kg of feed for beef cattle, and 11–18 mg/kg of feed for dairy cattle.
PhibroMonensin 100; PhibroMonensin 200; PhibroMonensin 400	Used as an additive to feed. Must be thoroughly and evenly mixed throughout the ration.	For prevention of bloat, use at a rate of: 25–33 mg/kg of feed for beef cattle, and 11–18 mg/kg of feed for dairy cattle.

**Table 6. Licks and blocks**

Product	Description	Instructions
Blotliq	Contains alcohol ethoxylate.	One block / 15 head.
Rumevite bloat block	Contains alcohol ethoxylate and vegetable oil.	One 20 kg block / 15 head. Replace as necessary.
Teric bloat block	Contains alcohol ethoxylate.	One 15 kg block / 10 head. Lasts approximately 15 days.
Optimol bloat ade block	Contains alcohol ethoxylate.	One 20 kg block / 10 head. Lasts approximately 20 days.

**Table 7. Pasture treatments**

<b>Product</b>	<b>Description</b>	<b>Instructions</b>
BP pasture spray anti-bloat	Mineral oil	100 mL/cow/day
Mobil anti-bloat oil	Mineral oil	55–85 mL/cow/day
No-Bloat	Mineral and animal oil	85 g/head/day
Bloat-Rid	Mineral and animal oil	60–113 mL/head/day
Bloatex	Mineral, animal and vegetable oil	85 mL/head/day
Bloat pasture spray	Paraffin oil	85 mL/head/day

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# Enterotoxaemia in cattle

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Enterotoxaemia or pulpy kidney is an acute poisoning condition caused by the bacterium *Clostridium perfringens* type D. The bacterium multiplies in the intestine and produces a toxin that is absorbed into the body, eventually killing the infected animal.

Enterotoxaemia can affect cattle of all ages and is also found in sheep, goats and other ruminants. The condition usually affects better-conditioned animals.

## CAUSE

The organism that causes enterotoxaemia is a normal inhabitant of the intestine but is usually present in low numbers. These organisms produce little toxin and, under normal conditions, are removed by normal gut movements or are inactivated by circulating antibodies.

Sudden changes in diet; grazing lush, rapidly growing pastures or young cereal crops; or heavy grain feeding (as in feedlots) enables the bacteria to multiply rapidly. Toxaemia occurs when the movement of food in the intestine slows or the organisms multiply and produce toxin faster than it can be removed or neutralised.

## SIGNS

Often, affected cattle are simply found dead. There are no prior signs of sickness and no evidence of struggling.

More commonly, the acute cases survive for about 24 hours. Symptoms mostly relate to nervous changes like sudden bellowing and mania followed by convulsions. Adult cattle may develop severe bloat before dying, which usually occurs 1–2 hours after the onset of convulsions.

There is also a less acute form of the disease in which the animal becomes quite dull and docile and appears to be blind. However, if the eyeball or eyelids are touched, the animal may close its eyes. Most of these cases recover completely in 2–3 days.

## DIAGNOSIS

Diagnosis is based on: the history of the animal or herd; the characteristic short course of the disease; and, more often than not, the nervous symptoms described above. Post-mortem and laboratory evidence showing increased numbers of *Cl. perfringens* and the toxin in the intestinal contents can assist diagnosis. The disease is harder to diagnose in cattle than in sheep.

Enterotoxaemia can be confused with rabies (not present in Australia), acute lead poisoning, grass tetany (hypomagnesaemia), tetanus, bacterial meningitis/encephalitis bloat on post-mortem, polioencephalomalacia (especially in feedlots), sporadic bovine encephalomyelitis, acute phalaris poisoning and arsenic poisoning.

## TREATMENT

Treatment is unsuccessful, due to the rapid course of the disease and the damage caused by the toxin.

## CONTROL AND PREVENTION

Prevention of enterotoxaemia requires the use of vaccines to promote immunity to the toxin and management practices to avoid the predisposing causes of the disease.

A vaccine containing a component protective against *Cl. perfringens* type D (pulpy kidney) is required. This can either be a single-component vaccine or a multi-component vaccine like 5-in-1. After the initial course of two vaccinations 4–6 weeks apart, booster doses may be necessary at intervals as short as 90 days, depending on the level of risk. Booster vaccinations should be given just prior to the expected flush of feed or other expected risk period, such as the use of concentrate feeds. The vaccine is given subcutaneously, preferably on the side of the neck.

Consult your veterinarian for advice concerning your particular herd's situation.

## ENTEROTOXAEMIA AND BLOAT

Bloat is caused by gases from fermentation being trapped in a foam within the rumen. This generally occurs when cattle graze young, rapidly-growing pastures with a high legume content, such as clover or lucerne. Bloat,

however, may also occur on young lush grasses, particularly oats and barley.

While bloat and enterotoxaemia are quite separate diseases, they are often found together, due to their association with grazing on similar pastures. The post-mortem picture for each is also quite similar.

There are numerous farmer reports of the value in using enterotoxaemia vaccine for the control of bloat. While firm evidence may be lacking, vaccination of cattle where bloat is a problem will do no harm and may decrease losses among cattle that may have enterotoxaemia.

## SUMMARY

Enterotoxaemia is an acute intoxication due to the absorption from the intestine of toxin produced by the rapid multiplication of *Cl. perfringens* type D. Rapid feed changes and grazing lush, young pastures may predispose stock to the disease.

Vaccination is a cheap and effective insurance against losses. However, the period of protection is short and booster doses may be necessary at short intervals to provide complete protection.

## RECOMMENDED 5-IN-1 VACCINATION PROGRAM FOR CATTLE

### Calves

One month before marking (10-weeks-old).  
Second vaccination at marking.

### Cows

Annual booster before calving.

### Bulls and steers

Annual booster.

### Heifers

Booster as yearlings. Booster before calving.  
For cattle which may not have been vaccinated (for example, recently purchased stock):  
vaccinate as soon as possible with a second vaccination 4–6 weeks later. Annual booster vaccinations.

### Enterotoxaemia

Remember, protection is short. Additional booster vaccinations are needed for cattle in high-risk situations. Use either an enterotoxaemia or 5-in-1 vaccine at least 14 days before the risk period.

## ATTENTION

Always keep vaccines cool but do not freeze.

- Inject under the skin of the neck and not into the muscle.
- Keep equipment clean and change needles regularly.

Follow instructions on the label.

# Prussic acid poisoning

The risk of prussic acid poisoning is increased during periods of drought and even more so after drought breaks when stressed, stunted plants begin to grow.

## What is prussic acid poisoning?

Prussic acid is also known as hydrocyanic acid (HCN). Prussic acid is not normally present in plants; however, under certain conditions, several common plants can accumulate large quantities of cyanogenic glycosides which can convert to prussic acid.

Prussic acid is a potent, rapidly-acting poison. It causes death by stopping body cells receiving oxygen.

## SOURCES OF POISON

### Plants

Approximately 200 plants are known to accumulate sufficient quantities of cyanogenic glycosides to cause poisoning. The plant species that commonly cause poisoning in livestock in Australia are listed in Table 8 below;

**Table 8. Plants responsible for prussic acid poisoning in Australia**

<i>Sorghum halepense</i> . Johnson grass
Sudan grass
Sorghum spp.
Sorghum–Sudan grass hybrids
<i>Cynodon</i> . Blue couch
<i>Brachyachne</i> . Native couches
<i>Eremophila maculata</i> . Native fuschia
<i>Acacia glaucescens</i> . Acacia
Linseed meal and cake (especially immature seeds)
<i>Heterodendrum oleifolium</i> . Rosewood

### Plant factors

Certain conditions lead to dangerous levels of cyanogenic glycosides in plants. These conditions include:

- Periods of rapid re-growth following stunting. These are times such as, after a drought breaks, if a crop is eaten back and then allowed to re-grow, or if a crop is harvested for hay then allowed to re-grow. Levels are highest in young plants with green, growing shoots.
- Frosted or wilted plants which have a transient increase in glycoside levels.
- Herbicide treated plants which have a transient increase in glycoside levels.
- High nitrogen and low phosphorus levels in the soil.
- Plant species such as sorghum which can contain more prussic acid than Sudan grass – varieties vary in their prussic acid potential.
- Plants that are wet with dew or light rain.

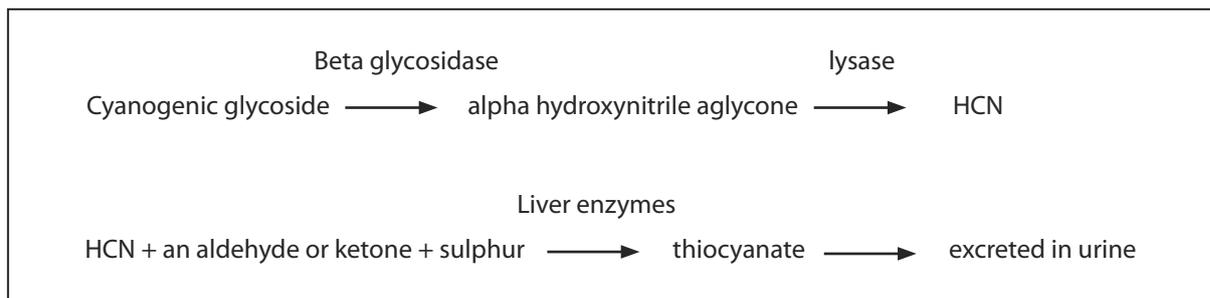
### Animal factors

Ruminant animals (cattle and sheep) are more susceptible to prussic acid poisoning than monogastric animals (horses and pigs). The lower pH in the stomach of the monogastric helps to destroy the enzymes that convert cyanogenic glycosides to prussic acid. For prussic acid poisoning to occur, high levels of cyanogenic glycosides and enzymes necessary to metabolise them need to be present. The action of rumen microbes will also metabolise cyanogenic glycosides. Therefore, poisoning is more likely in ruminant animals. Sheep are more resistant to poisoning than cattle due to their different enzyme systems in the fore-stomachs.

Hungry animals are also at greater risk as they will normally consume a larger amount of toxic material in a short time. This 'overload' of prussic acid can overwhelm an animal's ability to metabolise prussic acid to the non-toxic thiocyanate. Large amounts of prussic acid can, therefore, be absorbed and lead to poisoning.

Travelling or recently-introduced stock are at greater risk as they are unaccustomed to local plants. There is also evidence that animals become accustomed to the poison and can tolerate increasing amounts with experience.

**Figure 4. Process of prussic acid poisoning**



## SIGNS OF POISONING

Prussic acid enters the bloodstream of infected animals and is transported through the body. Prussic acid then inhibits oxygen utilisation by the cells so that, in effect, the animal dies from asphyxia.

Signs of poisoning usually occur 15–20 minutes after the toxin is consumed. Death occurs very quickly, approximately 2–3 minutes after the onset of clinical signs in peracute cases; within 1–2 hours in acute cases. Usually, animals are found dead with no signs observed. The brain and heart are the first to be affected by lack of oxygen, the resulting clinical signs include:

- Breathing difficulties
- Rapid, weak, irregular pulse
- Anxiety and restlessness followed by depression
- Stumbling/staggering
- Muscle tremors
- Moaning
- Dilated pupils
- Recumbency
- Bloat, and sometimes, salivation, vomiting
- Terminal convulsions
- Bright-red mucous membranes
- Death.

## DIAGNOSIS

A diagnosis of prussic acid poisoning is made on clinical and/or post mortem findings and by the recovery of the poison from the plants/feed and from the animal.

On post mortem examination, the blood may also be bright-red (although the blood will return to a dark colour a few hours after death) and clot poorly. Muscles may be dark and there may be haemorrhaging in the trachea and lungs. Haemorrhages will be evident on the surface of the heart. There may also be a smell of bitter almonds in the rumen. Samples for laboratory analysis include rumen contents (which should be frozen as soon as possible), muscle, liver and a sample of feed.

Prussic acid poisoning can be confused with nitrite poisoning, acute pulmonary oedema and emphysema, blue-green algae poisoning and anaphylactic reactions.

## TREATMENT

Urgent veterinary attention is necessary. It is essential to obtain the correct diagnosis as confusion with nitrite poisoning may be disastrous.

Treatment consists of re-establishing oxygen transport at the cellular level. Sodium nitrite is injected intravenously to convert haemoglobin to methaemoglobin, which reacts with cyanide (prussic acid) to form cyanmethemoglobin. A simultaneous injection of sodium thiosulfate provides sulphur to convert cyanmethemoglobin to the non-toxic thiocyanate which is excreted in the urine. An alternative treatment is to inject a large dose of sodium thiosulfate alone. This is the preferred treatment if there is suspicion that prussic acid poisoning is combined with nitrate poisoning. Treatment will need to be repeated.

Animals should be removed from the source of poison immediately and fed safe feed to help dilute the amount of poison in the rumen/stomach. Animals exposed to the poison source should be treated even if not showing any clinical signs. Animals should be handled as quietly as possible.

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**NOTE:**

Sodium nitrite and sodium thiosulfate are not approved for use in food producing animals. This matter is under urgent review. Contact your veterinarian for advice.

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**PREVENTION**

- Avoid grazing risky food sources. Have feed analysed if safety is in doubt.
- Do not graze drought-stressed, immature, wilted or frost-damaged plants that are known cyanogenic glycoside accumulators (see Table 1).
- Never graze sorghum that is less than 50 cm high.
- Feed hungry stock with hay before allowing them to graze forages which may contain high levels of cyanogenic glycosides/prussic acid.
- If buying sorghum hay, make sure that it was cut during low-risk conditions. There is no decrease in prussic acid content in the process of hay-making.
- Feeding material as silage will reduce the risk of poisoning as correct ensilage for three weeks reduces levels of toxin by approximately 50 per cent. On feeding-out, some toxin will be released as gas. It is still recommended that this feed is tested prior to use.
- Green chop forage may be safer than the same material used as pasture because selective grazing of high-risk leaf material is prevented.
- Linseed gruel should be thoroughly boiled to remove any free prussic acid.
- Supplementation of sulphur (if a deficiency exists) will increase the animal's efficiency at converting prussic acid to the non-toxic thiocyanate.

**FURTHER INFORMATION**

For further information, contact NSW Department of Primary Industries or your veterinary advisor.

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The Regional Veterinary Laboratory at Menangle can test feed samples for prussic acid. Samples may be sent via your veterinarian to any NSW Department of Primary Industries Regional Veterinary Laboratory for testing.

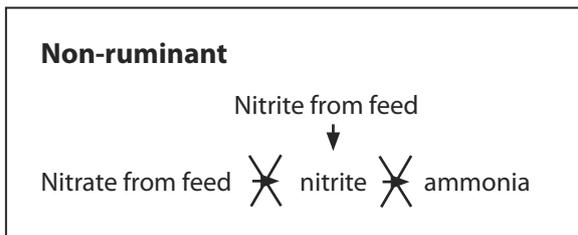
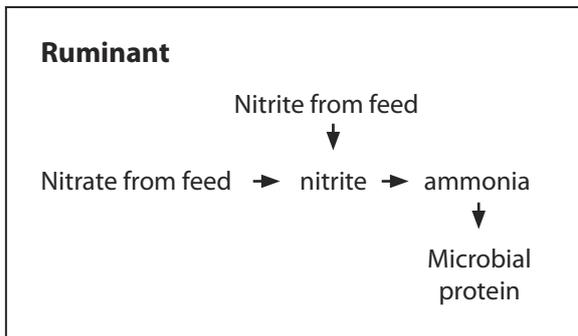
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# Nitrate and nitrite poisoning of livestock

During periods of drought, the amount of nitrate in the soil can increase greatly because of: a lack of leaching; reduced nitrate uptake by plants; and decomposition of organic matter. When the drought breaks, nitrate uptake by plants may be high, especially in the first week after rain. If hungry animals are allowed free access to such plants, losses from nitrate/nitrite poisoning may be disastrous.

## WHAT IS NITRATE/NITRITE POISONING?

Nitrates and nitrites are closely linked as causes of poisoning. Nitrate is not always toxic to animals. When feed containing nitrate is eaten by ruminant animals, nitrate is converted to nitrite, and then to ammonia, by rumen microbes. Non-ruminant animals are unable to do this.



Nitrates have a direct, caustic effect on the lining of the gut if consumed in large quantities. Signs of poisoning include diarrhoea, salivation and abdominal pain.

Nitrites are much more toxic. These are formed from nitrates during ruminant digestion and may also occur if stored plant materials heat-up or are attacked by bacteria or fungi. When high levels of nitrites accumulate in the gastrointestinal tract, they are absorbed into the bloodstream. Nitrite in the blood stream changes haemoglobin (the oxygen carrying part of blood) to methaemoglobin (which cannot carry oxygen). If enough methaemoglobin is produced, an animal will die. Some animals, though, can tolerate up to 50 per cent conversion of their haemoglobin without ill-effects but, when greater than 80 per cent is converted, death occurs.

## SOURCES OF POISONS

### Plants

Nitrogen is considered the plant nutrient most widely deficient in the world's soils. Various agricultural practices have therefore been developed to increase its soil concentration. These practices include incorporating legume varieties in pasture and applying various nitrogen-rich fertilisers (urea, sulphate of ammonia, blood and bone) to crops. Such practices sometimes cause plants grown in these soils to have nitrate levels above safe limits with livestock poisonings resulting.

Certain weeds, various root crops, cereal hays, and even immature cereal crops, can also cause these poisonings. More than 80 specific plants are known to cause nitrite poisoning. Some of these plants are listed in Table 9.

**Table 9. Some plants associated with nitrate/nitrite poisoning**

Crops/ pasture	Weeds
Oats	Capeweed
Sorghum	Variegated thistle
Maize	Mintweed
Rape	Crown beard
Lucerne	Pigweed
Kikuyu	Redroot
Turnip tops	Caltrop (cat's head)
Sugar beet tops	Marshmallow
Rye	Blackberry
Sudan grass	Fat hen
Soybean	
Wheat	
Barley	

## Plant factors

Under certain soil and environment conditions, plants can contain high levels of nitrates.

Factors that facilitate uptake of nitrate by plants include:

- Use of nitrogen-containing fertilisers.
- Low soil sulphur and molybdenum.
- Areas where stock have congregated and urinated/defaecated (yards).

Factors which cause nitrate to accumulate in the plant include:

- Drought.
- Cloudy or cold weather.
- Herbicide application – especially phenoxy herbicides such as 2,4-D.
- Wilting.

Amount of nitrate in plant tissues also depends on:

- Plant species.
- Stage of maturity.
- Part of the plant.

Nitrate concentrations are usually higher in young plants with these decreasing as plants mature. Most of the plant nitrate is also located in the bottom third of the stalk. Conversely, leaves contain less nitrate and flowers or grain contain little to no nitrate.

## Hay and Silage

Hays made from cereal crops, especially those grown under drought conditions and cut while sappy, can develop toxic nitrite levels when they heat-up. Oaten hay is particularly risky and becomes poisonous if previously-dry hay is dampened by rain or snow some time before feeding-out.

Hays made from nitrate-rich materials contain almost as much nitrate as when first made, unless some is converted to nitrite by heating or mould.

Silage contains less nitrate than its parent crop due to the fermentation process that it undergoes. Forages high in nitrate can lose from 40–60 per cent of their nitrate content during fermentation.

## Water

Water can contain toxic levels of nitrates. High-risk sources include water from deep wells fed by soil-water from highly-fertile soils; condensed water from ventilating shafts in piggeries where there are high ammonia levels in the air; and fluids draining from silos containing materials rich in nitrates. Water contaminated by fertiliser, animal wastes or decaying organic matter, may also be a source of toxic levels of nitrate. Marginally-toxic levels of nitrate in water combined with marginally-toxic levels of nitrate in feed can also lead to poisoning.

## ANIMAL SUSCEPTIBILITY

### Species

There is considerable variation between species in their susceptibility to nitrite poisoning. Pigs are the most susceptible, then cattle, sheep, and then horses.

Non-ruminants, such as horses and pigs, have no mechanism for converting nitrate to nitrite in their digestive tracts so they are not susceptible to nitrite poisoning due to excessive intake of nitrates. However, they are highly-susceptible to poisoning from nitrite intake (for instance in mouldy hay) because they cannot convert the nitrite to ammonia. Sheep are more efficient at converting nitrite to ammonia so this may be

the reason that they are less susceptible to nitrite poisoning than cattle.

### **Hungry stock**

These are at far greater risk than animals receiving regular and good fodder. This is because hungry stock consume more toxic feed and, in the case of ruminants, their rumen microbes will not be adapted to convert nitrite to ammonia. For example, it takes about twice as much nitrate to kill a ruminant when the nitrate comes from forages that are eaten over a long period of time, compared to that which is consumed very quickly. Animals receiving carbohydrate-rich fodders tolerate high nitrate and nitrite levels better than those that are not. This is because energy from carbohydrates (grain) helps rumen microbes convert nitrite to ammonia.

Animals that are stressed or in poor health or condition will also be more susceptible to nitrate /nitrite poisoning.

### **Adaptation or acquaintance**

Frequent intake of small amounts of high-nitrate feed increases the total amount of nitrate that can be consumed by ruminant animals without adverse effects. This is because rumen microbes are adapted to deal with the increased nitrate content of the feed.

## **SIGNS OF POISONING**

### **Nitrite poisoning**

The signs of nitrite poisoning usually appear 6–24 hours after the toxic material is consumed.

These include:

- Rapid, noisy and difficult breathing.
- Blue/chocolate-coloured mucous membranes.
- Rapid pulse.
- Salivation, bloat, tremors, staggering.
- Weakness, coma, terminal convulsions, death.
- Dark 'chocolate-coloured' blood.
- Abortions – pregnant females that survive nitrate/nitrite poisoning may abort due to a lack of oxygen to the foetus. Abortions usually occur 10–14 days after exposure to nitrates.

### **Nitrate poisoning**

- Diarrhoea and vomiting.
- Salivation.
- Abdominal pain.

## **POST-MORTEM FINDINGS**

### **Nitrite poisoning**

- Dark-red or coffee-brown blood which clots poorly.
- Pinpoint haemorrhages in internal organs and on internal surfaces.
- Accumulation of blood in the stomach wall.

### **Nitrate poisoning**

- Severe reddening and stripping of the stomach and intestinal linings.

## **DIAGNOSIS**

Diagnosis is based on observed clinical signs and possible exposure to toxic plants, feeds or water, post mortem findings and laboratory tests.

## **TREATMENT**

Urgent veterinary attention is required to confirm the tentative diagnosis and to treat affected animals. Stock should immediately be removed from suspect material. Also, handle stock as little and as quietly as possible. Hay or some other low-nitrate herbage should be fed to dilute the nitrate and/or nitrite in the stomach. Affected animals can be treated by intravenous injections of methylene blue, a powdered dye material. Methylene blue converts the methaemoglobin back to oxygen carrying haemoglobin. **It should be noted that methylene blue is no longer approved by the NRA for use in food-producing animals.** This matter is under urgent review. Contact your veterinarian for advice. If producers have an old supply of methylene blue on hand, they should consult their veterinarian before attempting to use it.

## PREVENTION

The risk of poisoning can be reduced by:

- Having feeds and forages analysed for nitrate when in doubt, such as drought-stressed, small grain forages.
- Not grazing stock on forages that are potentially-dangerous.
- Observing stock frequently when put on potential-risk feed.
- Feeding hungry stock on dry hay or mature grass before allowing free access to immature cereal crops or root-crop tops.
- Feeding only well-dried cereal hays.
- Preventing hungry stock from gorging recently-sprayed weeds.
- Preventing hungry stock from gorging highly-fertilised crops.
- Not overstocking risky pastures/grazing crops. Overstocking can result in more stalk material being consumed (the stalk contains the most nitrate in the plant.) Avoid strip grazing for the same reason.
- Not grazing high-nitrate pastures or crops for seven days after periods of rainfall, cloudy days, frosts, or high temperatures that cause wilting.
- Grazing stock on high-nitrate pastures or crops during sunny afternoons (when the temperature is above 15°C) and removing them at night. This reduces the amount of high nitrate forage consumed and helps rumen microbes to adapt.
- Preventing access to high-risk weeds around yards/sheds.
- Feeding risky material in small amounts diluted with safe feed, preferably high carbohydrate feed, such as grain (if accustomed to grain-feeding) and gradually increasing the amount fed. This only applies to ruminants.
- Ensure water does not contain high levels of nitrates.
- Not feeding green chop which has heated after cutting.
- Never feeding mouldy hay.

Another option to reduce the risk of nitrate/nitrite poisoning is to harvest and feed high nitrate forages as silage. This is because nitrate levels are reduced by the fermentation process

when feed is ensiled. Harvest these at least seven days after rain or cloudy weather, preferably later in the day. Harvesting close to maturity is also advised to reduce the risk of nitrate toxicity (although this means reduced digestibility of the feed). Raising the cutter head to selectively-avoid stalk bases is another method of risk reduction.

## FURTHER INFORMATION

For further information, contact NSW Department of Primary Industries or your veterinary advisor.

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The Regional Veterinary Laboratory at Menangle will test feed samples for nitrate. Samples may be sent via your veterinarian to any NSW Department of Primary Industries RVL for testing.

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