



tips & tools

ENVIRONMENT



Best management practices for feeding nitrates to cattle

Many cattle producers, particularly in northern Australia, feed non-protein nitrogen to cattle in the form of urea during the dry season to improve pasture consumption and animal productivity.

It has been shown that substituting nitrate for urea can have the added benefit of reducing methane emissions. For example, feeding nitrate at 10 grams per kilo of dry matter intake can reduce methane by 10 per cent.

Producers wanting to improve the environmental impact of their production system may be interested in applying this technique.

However there is a downside to feeding nitrates. If too much is consumed too quickly it is toxic to cattle as it reduces the oxygen-carrying capacity of the blood. In extreme cases, nitrate poisoning can lead to the death of the animal.

The risk of poisoning is greater in cattle fed low digestibility diets.

These nine guidelines have been developed to help producers decide how to feed nitrates to their herd more safely.

1. Assess the level of nitrate in the current pasture, feed and water supplies. If any are likely to be already high in nitrate, do not provide supplementary nitrate.

The level of nitrate that animals may be exposed to can be highly variable. Key risk factors include:

- plant species, with nitrate being higher in grasses and growing cereal crops
- plant parts, with higher nitrate concentrations in stems and lower leaves, but low levels in seeds
- plant stage of maturity, with nitrate concentrations higher in younger and regrowth plants than in mature plants
- growing conditions, with nitrate concentrations being higher in water-stressed plants that are still growing and in periods of rapid growth following water stress
- the use of nitrogen fertiliser
- water source from highly fertile soils, or that have been contaminated with fertiliser or decaying organic matter high in nitrates
- hays made from cereal crops, especially those grown under water-stressed conditions and cut while 'sappy' can develop toxic levels of nitrate if they heat up following baling.

For a more detailed list of nitrate risk factors, including plant species associated with nitrate poisoning, see NSW Department of Primary Industry's PRIMEFACT 415 (Nitrate and nitrite poisoning in livestock)¹.



¹ http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0006/111003/nitrate-and-nitrite-poisoning-in-livestock.pdf

2. Introduce nitrate into the diet of your herd gradually.

For the first two weeks, the maximum amount of a nitrate compound (either as calcium nitrate OR ammonium nitrate) that should be fed is shown below for cattle of different weights and fed diets with different dry matter digestibility (DMD) content.

Liveweight below	Maximum daily amount (g) for first two weeks if using calcium nitrate				Maximum daily amount (g) for first two weeks if using ammonium nitrate			
	Forage DMD				Forage DMD			
	45%	55%	65%	75%	45%	55%	65%	75%
300kg	23	28	31	35	19	23	26	29
400kg	25	32	36	39	21	27	30	32
500kg	27	34	39	41	22	28	32	34

For example, a herd with an average liveweight of 350kg on a diet with 50% DMD should be fed no more than 25g calcium nitrate, or no more than 21g ammonium nitrate per animal per day during the two-week adjustment period. If there is a wide variation in liveweight in the herd, err towards the lower weight range.

3. After the adjustment period, never feed cattle more than the maximum safe level of nitrate.

The maximum amount of a nitrate compound (either calcium nitrate OR ammonium nitrate) that should be fed is shown below for cattle of different weights and fed diets with different dry matter digestibility (DMD) content.

Liveweight below	Maximum daily amount (g) if using calcium nitrate				Maximum daily amount (g) if using ammonium nitrate			
	Forage DMD				Forage DMD			
	45%	55%	65%	75%	45%	55%	65%	75%
300kg	45	56	63	70	37	46	51	57
400kg	51	65	73	79	42	53	60	64
500kg	53	68	77	82	44	56	63	67

For example, a herd with an average liveweight of 450kg on a diet with 70% DMD should be fed no more than 77g calcium nitrate, or no more than 63g ammonium nitrate per animal per day. If there is a wide variation in liveweight in the herd, err towards the lower weight range.

- If practical, **keep a close eye out for signs of nitrate poisoning during and after the adjustment period** as some individual animals may have a naturally lower ability to adjust effectively to nitrate supplementation. (See next page for example of warning signs and symptoms).
- Do not feed nitrate to cattle when intake can markedly increase following periods of fasting, restricted intake or a change to a higher quality diet.** In these circumstances nitrate is consumed faster and therefore the risk of nitrate poisoning is greater.
- Avoid pulse-feeding nitrates to cattle.** When feeding nitrates to grazing cattle, they should be given continuous access to the nitrate source (usually in the form of a lick-block).
- In a feedlot system, ensure an even nitrate distribution.** Where cattle are on total mixed rations, the nitrate should be dissolved in the liquid supplement, prior to mixing the ration.
- Ensure that cattle being fed nitrates also have adequate sulphur intake,** in order to support rumen health. The recommended level is 2g of sulphur per 100g of nitrate.
- Stop feeding nitrates to cattle for at least 24 hours before any stressful or physically demanding activity, such as mustering.**



Warning signs of nitrate toxicity

The first signs that cattle may have been fed too much nitrates are diarrhoea, salivation and abdominal pain.

The next stage of nitrate poisoning involves an accumulation of nitrite – a by-product of nitrate – in the blood, where it reduces the blood's ability to carry oxygen.

Signs that nitrate poisoning has occurred include difficulty in breathing, with gasping, rapid breaths the most obvious symptom. Affected animals are weak and tremble and will stagger. Severely affected animals will go down, convulse and die.

What should I do?

Contact your nearest vet as soon as possible to confirm nitrate poisoning and how to treat affected animals.

If this is impractical, immediately remove the stock suspected of nitrate poisoning from any source of nitrate, and handle as little and as quietly as possible.

If possible, feed the affected animals hay that has not been fertilised with a nitrogen source, or some other form of low-nitrate herbage in association with no more than 20% (by weight) cereal grain. This will help rumen microbes to deplete accumulated nitrite.

Further information

NSW Department of Primary Industries' PRIME FACT 415 (February 2007).

Department of Economic Development, Job, Transport and Resources, Victoria's AGNOTE AG0701 (February 2002, Updated July 2008).

Queensland Department of Agriculture and Fisheries' Information on nitrate poisoning (February 2014).

These documents are accessible on the MLA website at mla.com.au/NLMP

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