Agnote

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Urea Poisoning in Cattle

H. Parkes, C. Shilton, Berrimah Veterinary Laboratories, Darwin and J. Eccles, Senior Field Veterinary Officer, Katherine

INTRODUCTION

Urea poisoning is one of the more commonly suspected toxicities of cattle in the Top End. Urea is used as a source of non-protein nitrogen (NPN) in feed supplements. In ruminants, nitrogen from urea is released in the rumen as ammonia and can be used by rumen microflora to synthesise protein. This protein then becomes available to the animal through the normal processes of digestion and absorption. However, if more urea is consumed than the rumen organisms can metabolise, the ammonia is absorbed from the rumen into the blood. The ammonia is then converted back to urea in the liver, and is then excreted by the kidneys. This pathway can easily be overwhelmed, when excess ammonia and urea circulate in the blood, causing poisoning. Poisoning can occur rapidly from a few minutes to four hours after consumption. Suspect urea poisoning if cattle are found dead close to the supplement.

CAUSES OF UREA POISONING

- Excess consumption of urea.
- Sudden introduction to high quantities of urea.
- Irregular consumption of urea.
- Wet supplement containing urea.
- Urea separating out from the supplement after transport; re-mix prior to feeding.

SIGNS OF UREA POISONING

Signs of poisoning can include twitching of ears and facial muscles, grinding of the teeth, frothy salivation, bloat, abdominal pain, frequent urination, forced rapid breathing, weakness, staggering, violent struggling and bellowing, and terminal spasms. Often, animals are found dead near the source of the urea supplement.

DIAGNOSIS OF UREA POISONING

The most useful diagnostic indicators are the history of access to urea and the signs shown by live, affected animals. Laboratory tests of blood samples are not very helpful, and no specific changes are seen at post-mortem examination. The following are general indicators of urea poisoning:

- History of access to urea.
- Laboratory testing of collected blood and rumen fluid immediately after death may indicate urea poisoning.
- Post-mortem – bloat; white foam in airways; ammonia odour when the rumen is opened; rumen pH 7.5-8.0.

Often a large pool of rumen fluid is seen on the ground at the nose of the beast. The animals usually suffer severe bloat and the fluid build up in gases forces the rumen fluid out through the mouth when the animal dies. Keep rumen and reticulum samples in formalin for subsequent diagnosis.

1. History of access to urea

Recent feeding history is important. Cattle become accustomed to metabolising urea, but if they miss out for a couple of days, and then are allowed sudden access, or if they consume more than normal, then poisoning can occur. Urea is very soluble and dissolves rapidly into puddles of water that can form on blocks after rain. Cattle that lick up these puddles can consume excess urea. Recommended feeding quantities vary according to what other feed is available and whether the cattle are accustomed to urea. Tolerance is decreased by starvation and by a low protein, high fibre diet. About 35 g of urea per day is considered sufficient for a 400 kg cow (i.e. approximately 0.1 g/kg body weight). It is recommended that urea should provide no more than 3% of the concentrate ration, or 1% of the total feed intake, and no more than one third of the total nitrogen intake should be NPN. In cattle, 0.3-0.5 g/kg/day (e.g. 120-200 g for a 400 kg cow) is considered to be toxic and 1-1.5 g/kg/day (e.g. 400-600 g for a 400 kg cow) can be fatal.

2. Laboratory testing

Blood ammonia levels can be measured, but this is only useful in live, sick animals. Proteins in the blood break down rapidly after death and produce ammonia, so testing blood from dead animals is of no value. For the same reason, the handling and storage of blood after collection is very important. Blood must be taken into lithium heparin or EDTA, placed immediately on ice and the plasma separated within 30 minutes of collection. Plasma may be stored for 2 hours at 4°C before testing, or frozen immediately and kept frozen until ready to test. These restrictions on measuring blood ammonia make it impractical as a diagnostic test in field situations. If it is important to measure blood ammonia levels, then collect blood from animals that appear unaffected, as well as from sick animals, and treat all samples the same way. If all samples show elevated ammonia, then it is likely to be a non-specific elevation (i.e. due to storage). Ammonia levels in rumen fluid can also be measured, but only fluid taken straight after death is likely to be of any value. Again, it must be frozen immediately and kept frozen until tested.

3. Post mortem examination and histopathology

Animals decompose rapidly after death from urea poisoning and there are no specific signs of poisoning. Post-mortem examination immediately after death can show evidence of bloat, generalised congestion of the carcase, excess fluid in the pericardial sac, pulmonary oedema with excess stable white foam in the large airways and haemorrhages on the heart (epicardial and endocardial). There can be a marked ammonia smell when the rumen is opened. The pH of fresh rumen contents is a useful test that can be done in the field. An alkaline rumen (pH greater than 7.5-8) is suggestive of urea poisoning.

There is very little in the literature on histopathological signs, but from our experience at Berrimah Veterinary Laboratories, there appear to be inflammatory changes in the rumen, particularly in animals that may survive the initial poisoning but die or are euthanised a day or two later. Inclusion of formalin-fixed sections of rumen and reticulum from animals that die from suspected urea poisoning, will assist diagnosis.

TREATMENT OF UREA POISONING

Treatment is rarely effective. However, if cattle can be handled, a stomach tube can be passed to relieve the bloat and then used to drench the animal with a large volume of cold water: 45 L for an adult cow is suggested, followed by 2-6 L of 5% acetic acid or vinegar. This dilutes rumen contents, reduces rumen temperature and increases rumen acidity, which all help to slow down the production of ammonia. Treatment may need to be repeated within 24 hours, as relapses can occur. Rumenotomy and removal of rumen contents is suggested for valuable animals.

SUMMARY OF BEST PRACTICE

- If cattle have not been previously supplemented, start with pure salt; slowly and then gradually introduce urea supplement – increasing it slowly and gradually to about 0.1g/kg body weight/day. (35-40 g/day for a 400 kg cow).
- Ensure that cattle get regular (daily) access to supplement once supplementation has started.
- If cattle unavoidably miss out on urea supplementation for a couple of days, then restart them at a lower intake level.
- Prevent over-consumption of supplement mix or blocks (e.g. by using salt to regulate intake).
- Feed supplement mixes or blocks under a roof to prevent urea getting wet and dissolving.
- Suspect urea poisoning if cattle are found dead close to the supplement.

REFERENCES

Two *Agnotes* on nitrogen supplementation are available. These are:

Nitrogen nutrition of cattle in the southern NT:

1. Nitrogen requirements, sources and use (J59) and
2. Supplementary feeding (J60).

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