Chapter Five: Cattle Nutrition

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Cattle grazing native pastures in the Top End region are generally limited by protein during the dry season and phosphorus (P) during the wet season. Research in the 1990s showed that feeding supplement to previously un-supplemented breeders was the key component in decreasing mortalities and increasing weaning rates.

**Supplementation**

Neil MacDonald and Kieren McCosker, DoR Katherine

**Cattle and land management best practices in the Top End region 2011**

**Chapter Five: Cattle Nutrition**

**Symptoms of nutrient deficiencies in cattle**

- poor condition
- lower than expected growth rates
- animals licking each other, posts etc
- chewing bones
- bottle jaw
- eating soil
- dull, woolly coats
- general listlessness
- sunken eyes
- anaemia
- pale muscles.
- poor productivity
- high incidence of broken bones.

**Wet season and dry season supplementation – why they are different?**

The dry season logically seems to be the time when supplementation would be needed. In fact, research has clearly indicated that providing phosphorus in the wet season when cattle are growing and putting on weight gives the most benefit.

It is easy to justify the costs of dry season supplements when feeding poor condition cows to improve survival and conception rates. Feeding of urea to dry stock will maintain liveweight and at best give moderate live weight gains – it should not be regarded as a production strategy to improve liveweight gain. Compensatory weight gain should be considered when evaluating the benefits of supplementing growing cattle during the dry season. Compensatory gain is the faster than normal rate of gain (i.e. in the wet season) following a period of restricted gain (i.e. during the dry season). The difference between supplemented and un-supplemented young cattle at the end of the dry season may become negligible over the wet season, provided the un-supplemented cattle did not lose weight or suffer a nutritional deficiency.

Acute phosphorus deficiency causes ‘pegleg’ where cattle (especially breeders) develop an arched body, staggering gait and thin brittle bones. Cases of pegleg are getting rarer. Chronic P deficiency is more important economically than acute deficiency and the only noticeable sign of a chronic P deficiency is greatly reduced performance.
Supplement distribution

The two main forms of supplementation are loose mix or blocks. Loose mix is a cheaper option but can be problematic during the late dry/early wet when there is a risk of rain causing urea poisoning. Supplement shelters should be provided if wet season loose mix is being fed. Commercial blocks are often used during the wet season as they are hard-setting and there is less risk of urea poisoning. This strategy can be useful in transition times when dry season supplement containing urea is necessary, but storms can occur.

Water medication is the cheapest option for delivering nitrogen but requires intensive management, and may not be effective for wet season supplementation in paddocks with surface water as the stock may not regularly drink from the trough.

Some producers use molasses to carry nutrients when it is relatively cheap.

Supplement ingredients

The main supplement ingredients are urea during the dry season and a phosphorus source such as Kynophos in the wet season. Some pastoralists add vitamins and trace minerals to their supplement, but unless there is a known deficiency, it is more cost effective to concentrate on providing the key limiting nutrients (protein and phosphorus).

- Urea is a concentrated form of non-protein nitrogen for making protein. It is more economic to feed breeders urea than to feed true proteins such as copra meal or cotton seed meal. Urea feeds the microbes in the cattle’s gut which assists them to digest dry fibrous grass over the dry season. It is important to introduce urea gradually over a number of weeks to allow the stomach microbes to adjust.
- Kynophos contains approximately 22% P (along with 23% calcium). Cheaper fertiliser-grade phosphates should not be used because of problems with excess fluorine and cadmium.
- Sulphate of ammonia (GranAm®) contains a small amount of nitrogen but is mainly used to supply the sulphur required in the making of protein from non-protein nitrogen. It is also used to slow down consumption as cattle dislike the taste.
- Salt is the animals’ main craving. It is used as a carrier to attract cattle onto the supplement and also to control consumption. Cattle also require some salt (sodium) in their diet.

Lick recipes vary for the early and late periods of the wet and dry seasons (Table 1).

Table 1. Loose lick supplement recipes

<table>
<thead>
<tr>
<th>Season mix</th>
<th>Urea (%)</th>
<th>Kynophos (%)</th>
<th>Sulphate of ammonia (%)</th>
<th>Salt (%)</th>
<th>When to feed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Late dry season</td>
<td>30</td>
<td>15</td>
<td>10</td>
<td>45</td>
<td>Until first rains. This mixture must not get wet as the urea will dissolve to form a poisonous liquid.</td>
</tr>
<tr>
<td>Wet season</td>
<td>0</td>
<td>40</td>
<td>10*</td>
<td>50</td>
<td>After first rains until about 1st April.</td>
</tr>
<tr>
<td>Early dry season</td>
<td>10</td>
<td>40</td>
<td>10</td>
<td>40</td>
<td>Early April until the end of May.</td>
</tr>
<tr>
<td>Dry season</td>
<td>15–25</td>
<td>15</td>
<td>10</td>
<td>60</td>
<td>Until about 1st September, depending on season.</td>
</tr>
</tbody>
</table>

* Reduce if consumption is lower than required.
Supplementation

Intake and feeding

- Intake of supplement for breeding cows should be 70–100 g/head/day. Cattle will eat more in the late dry season and less at the start of the wet season.
- Supplement should always be available and intake can be manipulated by using different proportions of ingredients.
- There may be some benefit in feeding pure salt to cattle before you begin feeding urea. This is a cheap way of satisfying initial craving and reduces the risk of urea poisoning.
- A strategy to reduce supplementation costs is to segregate cattle with a high requirement, e.g. feed a higher quality supplement to poor-condition lactating cows.

SUMMARY OF BEST PRACTICE

- Supplement cattle to address protein deficiency in the dry season and phosphorus deficiency in the wet season.
- Intake of supplement can be controlled by varying the proportions of sulphate of ammonia and salt.
- Supplementation for weaners may be more specific.

Source

Further information
DPI&F Animal Production Officer Ph: 08 8999 2263.
MLA EDGEnetwork® Nutrition EDGE course. Contact Pastoral Production Extension Officer DPI&F Katherine, Ph: (08) 8973 9763.

Related topics
**Water Consumption**

David Ffoulkes, DoR Darwin

Animals need water for biological functions such as excretion of waste in urine and faeces, transportation of nutrients in the blood, milk production and control of body heat by sweating and panting. The body of an adult cow contains 70 per cent water. A 10 per cent loss of total body water without replenishment can be life-threatening. On a hot day, loss of water in urine, faeces, respiration and sweat can amount to 15 per cent of liveweight. Only about a quarter of daily requirements may be replaced from green pasture and the rest must be replaced by drinking water. Cattle on dry feed will need to drink all of their water requirements.

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**Water consumption requirements**

The water requirements of cattle are closely related to dry matter (DM) intake of feed. The daily DM intake of roughage diets (e.g. pasture) is about 2 per cent of liveweight for young cattle and 1.8 per cent or less for adults.

For Brahman-type cattle (*Bos indicus*), daily water requirements are estimated to be 4.5 L/kg DM intake of feed at ambient temperatures of 25 °C, rising to 8 L/kg DM feed intake at 35 °C (SCA 1990). Temperate cattle (*Bos taurus*) require up to 25 per cent more water than tropical breeds. Productive breeder cattle require at least 30 per cent more water than dry cows. High humidity with higher temperatures increases thirst as does water containing salt at concentrations above 2000 mg/L per litre.

Estimates of allowances for water for Brahman-type cattle at different ambient temperatures are given below, assuming a DM intake of feed of 1.8 per cent liveweight.

**Table 1. Water requirements for Bos indicus cattle (Litres/day)**

<table>
<thead>
<tr>
<th>Liveweight</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>25 °C</td>
</tr>
<tr>
<td>250 kg</td>
<td>20</td>
</tr>
<tr>
<td>300 kg</td>
<td>24</td>
</tr>
<tr>
<td>350 kg</td>
<td>28</td>
</tr>
<tr>
<td>400 kg</td>
<td>32</td>
</tr>
<tr>
<td>420 kg</td>
<td>34</td>
</tr>
<tr>
<td>Pregnant (450 kg)(^1)</td>
<td>49</td>
</tr>
<tr>
<td>Lactating (12 L milk)(^2)</td>
<td>61</td>
</tr>
</tbody>
</table>

1. Third term allowance is 30 per cent more than for non-productive breeders.
2. Additional allowance of one litre water per one litre milk produced. (SCA 1990)

**Water trough supply**

A water trough with dimensions of 6 m x 0.75 radius holds 1.325 cubic metres of water or 1325 litres and takes 11 minutes to fill at flow rate of 120 litres a minute. Cattle need about 45 cm head space (depending on size of animal) to access the trough and their drinking rate is about 5 litres of water per minute.
The number of Brahman steers (350 kg) on dry feed at the end of the dry season (30 °C) that can be supplied with their daily water requirements by a trough holding 1080 litres may be calculated as follows:

- Each steer will require 38 litres per day.
- The trough can supply the requirements of 35 head (1325/38). If 11 animals on each side (head space 45 cm) can access the trough at once, all 22 head are able to drink their requirements in about 8 minutes and the water supply should keep up.
- If the trough refills at 1200 litres every 10 minutes, 27.5 steers can drink their allowance every 10 minutes, or 165 head an hour.
- At this rate, about 165 head can be watered each hour. Thus, a total of 495 head can be watered over a three-hour period. The maximum time suggested for a mob of cattle to remain at watering points on a daily basis is six hours.

In reality, water requirements of cattle vary from day to day and they usually drink about one-third of their requirements at one time. A common rule of thumb is to allow sufficient trough space and water supply for 10 per cent of the herd to drink at once.

The above example is only provided to put supply and allowances of water for cattle into perspective. Producers need to recalculate water requirements for their own situation and this should be based on maximum projected water allowances and stocking rate, plus a safety margin.

**SUMMARY OF BEST PRACTICE**

- Calculate water requirements for your own situation based on a maximum projected water allowance and stocking rate, plus a safety margin.

**Source**


**Related topics**

Dams, Distance to Water, Water Quality.
Water Quality
Harmony James, formerly DRDPIFR Tennant Creek

Quality of water has a direct effect on daily consumption of water by stock. This in turn influences feed consumption and overall performance. Poor water quality can cause a reduction in intake and lead to health problems and loss of production. Water quality also impacts on the efficiency and effectiveness of water medication units. Water should be tested for its suitability for stock. The most important things to test in water for domestic stock use are pH, salinity and chloride levels. Water testing services are available at DPI&F Berrimah Water Chemistry Laboratory. Samples for domestic stock use can be taken in an ordinary plastic bottle and do not require refrigeration.

pH
Water for domestic stock use should be in the pH range of 6.5 to 8.5. If the pH is less than 5.5, acidosis and reduced feed intake may occur. Highly alkaline water (over 9) may cause digestive upsets and diarrhoea, lower feed conversion efficiency and reduce intake of water and feed.

Salinity
Salinity (total dissolved salts) is the sum of all mineral salts present in the water, including sodium, calcium, magnesium, chloride, sulphate and carbonate. It is often measured as electrical conductivity, EC. The maximum salinity level for beef cattle is 9000 mg/L, but more than 6000 mg/L is not suitable for lactating cows and calves. Evaporation can cause an increase in total dissolved salts. Water tested from dams or rivers as suitable for stock early in the dry season may become significantly more saline as the year progresses.

Chloride
An excess of chloride is synonymous with salt (sodium chloride) toxicity. In ruminants, excessive chloride levels increase osmotic pressure in the rumen. This causes a reduction in food intake. Excess sodium chloride can result in dehydration, kidney failure, nervous system dysfunction and death. The maximum acceptable level of chloride in water for beef cattle is 4000 mg/L.

Fluoride
Excessive amounts of fluoride in water supplies can cause production losses. Fluoride concentrations of more than 2 mg/L in water can cause tooth damage to growing animals and bone lesions and brittle bones in older animals. If the feed contains fluoride then the maximum fluoride level should be only 1 mg/L.

Calcium
Levels above 1000 mg/L may cause phosphorus deficiency by interfering with phosphorus absorption in the gastrointestinal tract.

Sulphate
No adverse effects should be expected below 1000 mg/L. Between 1000 and 2000 mg/L sulphate can cause diarrhoea, particularly in young cattle. Concentrations above 2000 mg/L can cause chronic or acute health problems.

Nitrate
Excess nitrate can cause toxicity symptoms and even death by reducing the oxygen carrying capacity of the blood. Stock may tolerate higher nitrate concentrations in drinking water provided nitrate concentrations in feed are not high. Levels above 1500 mg/L are likely to be toxic and should be avoided.
Blue green algae

Blue green algae (cyanobacteria) is not a common problem in the Top End region, but is worth watching out for, and investigating if unexplained deaths of cattle are experienced. Pollution of water with fertiliser and excreta provides nutrients for algal blooms which grow rapidly under warm sunny conditions, particularly in shallow water. The consumption of only small quantities of water infected with the bacteria can be lethal due to the high concentration of toxins which can affect the nervous system or liver and cause death.

Dams should preferably be deep with relatively small surface area, and if blooms occur, stock should be denied access. Water tanks should have covers to exclude light to prevent growth of algae.

<table>
<thead>
<tr>
<th>SUMMARY OF BEST PRACTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Know the quality of your water.</td>
</tr>
<tr>
<td>• Test water for suitability for stock.</td>
</tr>
</tbody>
</table>

Source

Dairy Australia.


Further Information

DLRM Water Quality Guidelines.

DPI&F Primary Industry Laboratory Services,
Water Chemistry Ph: (08) 8999 2196
BAL Building, Berrimah Farm, Makagon Rd, Berrimah.

Related topics

Water Medication, Water Requirements.
Chapter Five: Cattle Nutrition

Water Medication
Mark Tarrant, DNRETAS Katherine

Water medication is the process of delivering nutrient supplements to livestock through the water they drink. This innovative process is becoming more widely adopted across northern Australian cattle properties. With traditional methods of supplementation such as lick blocks and loose mixes, some animals over-consume, some get too little and others none at all. Water medication delivers the correct dose to all animals.

Top End Region

The scope for the use of water medication in the Top End is limited on many properties as there is surface water available in paddocks for the duration of the wet season and some of the dry season.

Recommendations

It is strongly recommended that first-time users proceed with caution and thoroughly research their specific needs before installation.

A water chemistry test on each bore or water source is essential for designing the correct nutrient mix. Adjustments will be necessary to allow for the pH and dissolved salts in the water supply. Several nutrient formulations are available for different water situations and feeding requirements. Some users may require acidic formulations to neutralise alkaline water and formulations are available to provide phosphorus, trace elements and vitamins. Water chemistry can have a huge influence on the success of water supplementation, so it is imperative to have all of your water supply and nutrient requirement information prior to medicator installation.

When new to water medication, install only one unit to start with. Set it up close to the homestead where it can be easily monitored and teething problems solved before establishing more units. The risk of over-dosing will be reduced if only one, or at most, two people are responsible for the water medicator(s).

Calculations based on commercial operations have demonstrated that when more than seven or eight units are installed, the equivalent of one full-time person will be required to fill, monitor and service the medicator units. Although this sounds costly, it can be argued that the improvements in cattle performance and reduced cost of supplementation outweigh the extra labour. This form of nutrient delivery can be extremely successful if managed correctly. Failure of a water medication system can have disastrous results.

The proven positive aspects of water medication systems generally outweigh the negative aspects.

Advantages
• cheapest form of supplementation available
• every beast in paddock receives supplement
• congregation around watering points is limited due to the absence of lick blocks and loose mixes, which act as attractants.

Disadvantages
• cannot be used as efficiently if surface water is available in the same paddock
• upfront cost of units
• requires skilled operators to manage, monitor and service units
• reported failures. Critical failure of water medication systems can result in cattle deaths through urea poisoning. The reasons for reported failures have included:
  • operator error
  • equipment malfunction
  • system failure
  • damage, corrosion and wear on equipment and fittings.
Table 1. Cost comparison of supplementation methods

<table>
<thead>
<tr>
<th>Product</th>
<th>Cost/tonne ($)</th>
<th>Recommended feed rate (g/head/day)</th>
<th>Urea (%) in product</th>
<th>Grams of urea at recommended rate</th>
<th>Actual rate to deliver 60 g urea</th>
<th>Cost/head/day to deliver 60 g urea (¢)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proprietary water medication mixes</td>
<td>970</td>
<td>55</td>
<td>72</td>
<td>40</td>
<td>83</td>
<td>8</td>
</tr>
<tr>
<td>Loose mixes</td>
<td>550</td>
<td>150</td>
<td>30</td>
<td>45</td>
<td>200</td>
<td>11</td>
</tr>
<tr>
<td>Blocks</td>
<td>1200</td>
<td>70</td>
<td>30</td>
<td>21</td>
<td>200</td>
<td>24</td>
</tr>
<tr>
<td>Commercial liquid NPN supplement</td>
<td>500</td>
<td>1000</td>
<td>4.7–11.6</td>
<td>50</td>
<td>1200</td>
<td>20–50</td>
</tr>
</tbody>
</table>

(From Water Medication: A guide for beef producers, MLA 2006)

SUMMARY OF BEST PRACTICE

- Thoroughly research your water medicator and supplement needs.
- Install one unit close by, initially, to become familiar with the water medication system.
- Conduct a detailed chemistry analysis of the water supply.
- Ensure employees managing water medicators are appropriately skilled.

Sources

Russell Teece, former Manager, Pigeon Hole Station.

Related topics

Near Infrared Reflectance Spectroscopy (NIRS)

Kieren McCosker, DoR Katherine

Faecal Near Infrared Reflectance Spectroscopy (NIRS) uses faecal samples to estimate diet quality selected by animals. NIRS gives an estimate of the following facets of the diet as selected by the animals:

- crude Protein (CP) concentration
- faecal Nitrogen (N) concentration
- dry matter digestibility (DMD)
- non-grass percentage

These estimates allow the prediction of:

- liveweight gain
- response to urea, a rumen degradable nitrogen (RDN)

NIRS diet quality estimates are most accurate in forage-only diets. Molasses-urea supplements, cereal grain or protein mixes are reported to influence NIRS estimates. NIRS is a valuable management tool, particularly for predicting animal responses to rumen degradable nitrogen.

Sample collection

How to collect samples

1. Fresh dung is required and is usually found at watering points, supplement stations or cattle camps.
2. Avoid contamination with soil, plant material or dung beetles.
3. Samples from 10–15 different animals should be combined to make a composite sample. Put the composite sample in an appropriate, labelled container such as a zip-lock plastic bag for storage and despatch. Refrigerate or freeze the sample as soon as possible after collection. Try to keep the sample as cool as possible.
4. If drying facilities are available, samples can be oven-dried at 60 °C to 65 °C. The sample should be broken up during drying to hasten the process. The dried sample can be posted. Sun-drying can be used as an alternative to oven-drying. DMD estimates on sun-dried faeces are recorded to be about 1.5% lower than those on oven-dried faeces. Values can be corrected if sun-drying is noted on the information sheet for that sample.

Sun-drying samples

1. The faecal sample to be dried should be placed on a piece of clean, flat galvanized iron sheet or other non-absorbent sheet.
2. The sample should be spread out like a pancake to a thickness of 10 mm or less.
3. After about four hours in the sun, the sample should be turned over trying to keep the sample in one piece.
4. After another four hours, the sample should be dry provided the weather remained sunny.
5. Once dry, samples can be broken up and placed in labelled zip-lock plastic bags for sending to Symbio Alliance.

Caution: If the samples are not properly dry, they can sweat in the zip lock plastic bags and become mouldy. An alternative is to put the sun-dried samples in labelled paper bags, or even wrap them in newspaper.
Submitting the sample

Place the sample and completed Analysis Request Form and Field Collection Data Sheet in the pre-paid courier bag provided and post to Symbio Alliance for testing. The cost of postage is currently included in the price of analysis.

If an estimate of phosphorus content is required, note this on the Analysis Request Form. Phosphorus analysis is an additional cost.

How often to sample

The reason for analysing samples will determine frequency of samples. Monthly samples are often collected. To generate annual trends, the collection of samples every two months may suffice.

Results

How long will it take to get results back?

The results are usually returned in an email, with an MS Word document attached (Figure 1).

Figure 1. Example of a results record provided by Symbio Alliance

How to interpret results

Dietary crude protein concentration

Dietary crude protein (CP) results represent the protein content of the pasture selected by the animals. In northern Australia, dietary crude protein results are usually below 10%, even during periods of active pasture growth. For the pasture to meet the maintenance requirements of a 400 kg non-pregnant and non-lactating Brahman cow, a dietary crude protein content of approximately 5% is required.

Faecal N concentration

Faecal N is comprised of undigested N, microbial N and N losses from the animal. It can be used as an indicator of the adequacy of RDN. When faecal N concentrations fall below 1.3%, a response to urea supplementation can be expected.

Dry Matter Digestibility (DMD)

DMD is an indicator of the energy in the pasture and represents the energy available to be digested and absorbed. In northern Australia, a digestibility reading of 65% or more represents a good high-quality pasture, most probably green, lush and actively growing. A reading of 45% is a low reading and probably indicates that the energy levels are below maintenance requirements. The supplementation of energy is usually not cost effective for the Top End region and therefore at this level, animals should be removed from the paddock.

Non-grass percentage

The non-grass percentage estimates the proportion of the diet selected by animals that is not grass i.e. the proportion of top feed and forbs, including legumes in the diet. During the dry season, the non-grass proportion could be in the order of 30–40% and in the wet season 10–15%, depending on the country.

Predicted liveweight gain

Growth rate is affected by animal factors as well as dietary factors. To achieve meaningful results from NIRS samples, information relating to the animals should accompany samples such as age, sex, weight and condition.

Predicting response to rumen degradable nitrogen (RDN)

NIRS predictions of metabolisable energy (based on DMD and CP) allow the estimation of the amount of RDN being supplied to the rumen. The ratio, DMD/CP indicates whether rumen fermentation and pasture intake are limited by effective rumen degradable protein (ERDP). A response to RDN (urea) supplementation is likely when the DMD/CP is greater than eight and highly likely when greater than 10.

The DMD/CP ratio should provide a measure of the ERDP being supplied. Therefore, it is assumed that if at DMD/CP = 16, an animal requires 90 g of supplementary urea and 0 g at DMD/CP = 7. The suggested amounts of supplementary urea at various DMD/CP ratios in Table 1 should be appropriate (Dixon and Coates, 2005).
Table 1. Recommended amounts of supplementary urea for cattle 250–350 kg liveweight when the DMD/CP ratio is measured with NIRS

<table>
<thead>
<tr>
<th>DMD/CP ratio</th>
<th>Amount of supplementary urea per head per day (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8–9</td>
<td>20</td>
</tr>
<tr>
<td>9–10</td>
<td>30</td>
</tr>
<tr>
<td>10–12</td>
<td>50</td>
</tr>
<tr>
<td>12–14</td>
<td>70</td>
</tr>
<tr>
<td>&gt; 14</td>
<td>90</td>
</tr>
</tbody>
</table>

Care is needed to avoid urea toxicity when the larger amounts of urea indicated in Table 1 are fed, particularly to animals of low liveweight. Urea levels should be gradually increased to avoid toxicity. Ensure supplement is available at all times when high levels of Urea are being provided.

Sources

Kieren McCosker, DPI&F Katherine.


Further information

Kieren McCosker, DPI&F, Katherine, Ph: (08) 8973 9771.

MLA EDGEnetwork® Nutrition EDGE course.

Contact Pastoral Production Extension Officer DPI&F Katherine, Ph: (08) 8973 9763.


Related topics

Native Pastures of the Top End, Supplementation.
Management throughout Dry periods

Anne-Marie Huey, formerly DPIFM Katherine and Arthur Cameron, DoR Darwin

The regular, reliable wet and dry seasons experienced across the Top End region can give producers a false sense of security. Poor seasons can – and do – occur, and a strategy to deal with less than average rainfall is essential. If stocking rates (and therefore grazing pressure) are not adjusted to reflect actual seasonal conditions, land condition and pasture quality will decline.

Top End Region

In the Top End, dry periods are generally seasonal. They occur at the end of the dry season in the October to December period. They occur when the opening rains of the wet season are late. This is quite variable between districts and properties. Dry periods are most severe when a late start to the wet season follows an early finish to the previous wet season. The length of the dry season is more important than the amount of rain that falls over the wet season.

Pasture management

Heavy grazing of perennial grass species during the growing season leads to a reduction in pasture root biomass which results in the plant having a lower chance of surviving subsequent long dry seasons. The combination of dry periods and grazing can accelerate the death of many grasses and significantly contribute to the degradation of land condition.

Herd management

The combination of long-term pasture degradation and poor seasons can have serious effects on overall herd productivity if unmanaged. In a monsoonal environment, the optimal calving period is October to February, when the period from cows calving to re-conceiving is shortest. If breeder herds are not managed accordingly, i.e. weaners are left on their mothers and breeders’ body condition falls below 4 (on a 9 point scale), the likelihood of cows calving in this optimal period is reduced. This results in a cumulative reduction in herd productivity. Breeders may take a number of years to synchronise with the optimal calving season again. Therefore, it is important to prevent undue loss of breeder condition in the dry season in order to maintain or improve weaning percentages.

Weaning is a cost-effective tool for managing breeder condition. It is cheaper to feed the calf than to feed the cow sufficient to both maintain body condition and lactate. Weaning calves down to 100 kg will assist breeders to maintain condition over the dry and improve their chances of getting back in calf later in the year. Weaners weighing 100 kg should do well on spelled native pasture and supplement, or improved pasture, eliminating the necessity of feeding a true protein supplement such as copra or cotton meal. In poor years, weaning lighter than 100 kg may be necessary. These early weaners require a highly digestible quality diet.

Animal nutrition and supplementation

Supplementation of the entire herd is advisable, particularly in drier years and where various classes of animals can not be adequately segregated. As soon as grass stops growing, nitrogen levels begin to decrease. This means that urea may be required earlier in the dry season than in wetter years.
It is important to remember that cattle will eat up to 20% more pasture when supplement is available. This is a crucial factor to consider when calculating forage budgets and stocking rates and evaluating management options.

Poor seasons will also affect the quantity and quality of annual grasses, forbs and some legumes. These species are highly nutritious and play an important role in overall diet quality, contributing significantly to weight gain over the wet season. Shorter growing seasons for these plants means there are less of them and they may lose their nutritional value sooner, placing greater pressure on the remaining pasture.

In some years, good quality hay for supplementary feeding may be difficult to source or in short supply.

**Duty of care**

Under the *Northern Territory Animal Welfare Act* persons in charge of animals have an obligation to provide appropriate needs for their animals.

Producers need to implement reasonable drought management strategies for the welfare of their livestock. The Australian Model Codes of Practice for the Welfare of Animals have been developed to define appropriate animal care and to determine acceptable animal welfare standards. These Codes are being replaced by National Standards and Guidelines that will be enforceable in all Australian States and Territories. A copy of these codes can be downloaded from www.publish.csiro.au.

**SUMMARY OF BEST PRACTICE**

- Monitor when the wet season ends and assess quality and quantity of pastures as soon as possible.
- Develop a strategy for dealing with poor seasons.
- Assess the current seasonal situation.
- If a season is considered to be ‘poor’, consider the available options, including financial options.
- Decide which cattle are to be sold. Making EARLY and timely decisions reduces grazing pressure.
- Decide which cattle are to be kept and whether at home or on agistment.
- Decide on the desired performance of remaining cattle.
- Determine which nutrients are limiting, or are most likely to limit, performance.
- Choose a supplement to rectify deficiencies and achieve the desired performance, economically.
- Do not leave cattle to perish in the paddock, monitor regularly and humanely destroy if necessary.

It is important to remember that cattle will eat up to 20% more pasture when supplement is available. This is a crucial factor to consider when calculating forage budgets and stocking rates and evaluating management options.

Poor seasons will also affect the quantity and quality of annual grasses, forbs and some legumes. These species are highly nutritious and play an important role in overall diet quality, contributing significantly to weight gain over the wet season. Shorter growing seasons for these plants means there are less of them and they may lose their nutritional value sooner, placing greater pressure on the remaining pasture.

In some years, good quality hay for supplementary feeding may be difficult to source or in short supply.

**Duty of care**

Under the *Northern Territory Animal Welfare Act* persons in charge of animals have an obligation to provide appropriate needs for their animals.

Producers need to implement reasonable drought management strategies for the welfare of their livestock. The Australian Model Codes of Practice for the Welfare of Animals have been developed to define appropriate animal care and to determine acceptable animal welfare standards. These Codes are being replaced by National Standards and Guidelines that will be enforceable in all Australian States and Territories. A copy of these codes can be downloaded from www.publish.csiro.au.

**SUMMARY OF BEST PRACTICE**

- Monitor when the wet season ends and assess quality and quantity of pastures as soon as possible.
- Develop a strategy for dealing with poor seasons.
- Assess the current seasonal situation.
- If a season is considered to be ‘poor’, consider the available options, including financial options.
- Decide which cattle are to be sold. Making EARLY and timely decisions reduces grazing pressure.
- Decide which cattle are to be kept and whether at home or on agistment.
- Decide on the desired performance of remaining cattle.
- Determine which nutrients are limiting, or are most likely to limit, performance.
- Choose a supplement to rectify deficiencies and achieve the desired performance, economically.
- Do not leave cattle to perish in the paddock, monitor regularly and humanely destroy if necessary.

Sources

Kieren McCosker, DPI&F Katherine.
Robyn Cowley, DPI&F Katherine.

**Related topics**

Chapter Six: Animal Health

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Clinical Signs

- refusal to eat and drink (paralysis of tongue)
- dehydration
- drooling of saliva
- sunken eyes
- weakness
- flaccid paralysis (back to front legs)
- aggressive behaviour
- often the classic signs are not observed in chronic cases, animals just appear weak and lethargic.

Diagnosis

Cattle affected by botulism usually have a history of at least one or more of the following factors:

- no protection (immunity) or inadequate protection against botulism toxin due to failure to vaccinate or ineffectively administered vaccine
- no supplement to address protein and phosphorus deficient dietary needs
- access to bones or carcasses.

Cattle may simply be found dead. On autopsy the omasum ‘bible’ may be hard and dry or bone, carrion or maggots may be present in the reticulum ‘honeycomb’.

The toxin causes a paralysis, and some live cattle display classical signs.

Treatment

Treatment options are limited. Once a beast has absorbed botulinum toxin and has become affected nothing can be done to treat the animal or hasten recovery.

Prevention

- vaccination
- supplement phosphorus/protein
- remove dead carcasses.

Vaccination

It is recommended that all cattle over six months of age be vaccinated with a bivalent (Type C & D) vaccine. Two types of botulism vaccine are available. A long-acting vaccine is available in single shots to provide protection for between one and three years. A conventional vaccine involves a single shot followed by a recommended booster four to six weeks later to provide protection for up to one year. A booster vaccine is required to maintain immunity. Most producers use a single shot for convenience.
SUMMARY OF BEST PRACTICE

• Vaccinate all cattle over six months of age.
• Supplementary feed stock to prevent phosphorus or protein deficiencies.
• Botulism should be considered present on all stations in the Darwin region. Vaccination is essential and cheap.

Source

Further information
DPI&F Senior Field Veterinary Officer, Darwin. Ph: (08) 8999 3035.


Related topics
Cattle Vaccination, Supplementation.
Pestivirus (Bovine Viral Diarrhoea Virus) is an extremely complex disease that may be associated with reproductive losses, ill thrift and death in weaners and an increased susceptibility to secondary infections. Two Type 1 strains of BVDV, Trangie and Bega, have been identified in Australia. Infection is considered to be endemic in the Top End region with varying prevalence in cattle herds throughout the region. Bovine pestivirus is spread by close contact between cattle. Temporary high-stocking situations such as mustering, yarding, trucking and supplementary feeding/watering sites contribute to the spread. The virus is spread in the saliva, nasal secretions, urine, faeces, semen and milk of persistently infected (PI) animals, and may be transferred by midges and mosquitoes.

Affected animals recover completely and develop immunity. However, if susceptible female animals become infected during pregnancy there are a number of different scenarios that can develop. Infection in the first trimester of pregnancy can lead to abortion or the birth of a persistently infected (PI) animal which in turn becomes a carrier. Infection in the middle trimester usually leads to abortion or abnormal, defective calves. Infection in the last trimester is usually associated with no reported problems.

If cattle are infected with the virus prior to joining, there is little impact on the herd. In fact, one of the management strategies in endemic herds is to ensure all replacement heifers are run with a PI animal prior to mating so they have acquired immunity prior to joining. The main concern with pestivirus is when a carrier (or PI) is introduced onto a herd of susceptible pregnant females. The main risks are therefore from infected neighbouring animals and the purchase of pregnant cows that may give birth to a PI animal.

**Clinical Signs**

Pestivirus is capable of causing a range of disease ‘syndromes’ in cattle herds.

- embryonic death and decreased conception rates, resulting in lower weaning rates
- dummy or abnormal neonatal calves
- persistently infected carrier animals that are usually (but not always) poor doers.

**Bovine viral diarrhoea (BVD)**

BVD occurs when healthy cattle are infected with pestivirus, but the clinical disease is rarely seen in Australia, with most pestivirus infections going unnoticed, as pestivirus type II is not present in this country. Cattle infected with pestivirus are more susceptible to other infections due to a depressed immune response, especially in the feedlot situation where they are at more risk of acquiring Bovine Respiratory Disease. Infected cattle develop a strong immunity after recovery.
Mucosal disease
Mucosal disease occurs when a persistently infected animal is infected with a second strain of pestivirus. The prevalence of mucosal disease is quite low <0.5% in Australian herds. Affected cattle will drool excessively, appear depressed and feverish, and have persistent and often bloody diarrhoea, and sometimes a soft cough and lameness. The severity of mucosal disease varies from an acute form with death within a few days to chronic wasting disease.

With the acute form of mucosal disease, profuse diarrhoea and ulcers may be present in the nose, mouth, eyes and between the toes. At post-mortem, these ulcers are often found to extend right through the upper and lower intestinal tract. With the chronic wasting form of mucosal disease, calves just grow poorly. At post-mortem there are often no visible abnormalities, but microscopic changes can be found. Persistent infection with pestivirus should always be considered where some young cattle in a mob are doing very poorly while most of the other cattle are doing very well.

Most PI animals die within 18–24 months of birth, however there will be a very small proportion of persistently infected animals that are normal and appear healthy. These cattle, if selected as breeders, pose a significant risk to susceptible breeders in the herd.

Diagnosis
Blood samples (10–30) can be collected from a range of age groups in the herd to determine what proportion of the herd has been exposed to pestivirus. The antibody test can give an indication of whether pestivirus infection has occurred in the herd within the past 3–9 months. The antigen test (blood or ear notch sample) can identify animals that have ‘active infection’ and are shedding the virus. These are usually persistently infected animals. Fresh tissues from aborted foetuses can also aid in the diagnosis of reproductive problems associated with pestivirus.

Prevention and Control
Control of bovine pestivirus centres around ensuring replacement heifers develop a strong immunity before they are joined. In herds that are infected with pestivirus, exposure of naive cattle occurs when a persistently infected animal enters the group and spreads the infection by direct contact. In herds that are free of pestivirus, control centres around appropriate biosecurity measures to keep introduced and neighbouring stock away from pregnant females.

Vaccination
A pestivirus vaccine (Pestiguard™) containing inactivated virus is available in Australia. Immunity is achieved following a course of two shots of the vaccine 4–6 weeks apart and maintained with an annual booster. Both shots of the vaccine must be given prior to joining for foetal protection to occur. Timing of booster vaccinations is not as critical as initial vaccination. Bulls should also be vaccinated in addition to breeders as healthy normal bulls can be transiently infected and shed pestivirus in their semen for a short period after natural exposure.

SUMMARY OF BEST PRACTICE
• Consider further investigation into the prevalence of pestivirus if signs and symptoms of pestivirus are observed or low pregnancy/branding rates recorded.
• Where the virus is present, exposure during weaning is preferable to ensure replacement heifers develop immunity prior to joining.
• A vaccine is available for use in herds where constant reproductive losses occur due to this virus and natural exposure is not achieved prior to joining.
• Producers considering introducing a control program should consider:
  – the BVDV status of the herd or breeders
  – the risk of introducing BVDV infection to a naïve herd
  – costs versus benefits of introducing the control program.

Source
Bovine Pestivirus Australia.
www.bvdaustralia.com.au
Dark-coated cattle, bulls, older cattle and those in poor condition usually attract the heaviest infestations of fly. Bos indicus cattle can carry high numbers of fly but do not appear to be as severely affected as other breeds.

**Shaded areas show buffalo fly distribution (MLA 2003)**

According to the Pastoral Industry Survey (2004), 96% of properties in the Darwin region use chemical fly-control treatments. Some pastoralists cull affected animals to delay the need to treat the entire herd and to build up a more fly-resistant herd. If the herd is carrying low numbers of buffalo fly, treatment may not be required. Other alternatives to chemical control include the buffalo fly tunnel trap, dung beetles and tolerating a certain level of fly burden. Use of these methods will minimise chemical resistance and residue risks.

Current buffalo fly control strategies aim to:

- reduce buffalo fly numbers to acceptable levels to prevent production loss
- provide for welfare considerations
- minimise chemical residue risks
- reduce reliance on chemicals by controlling fly with alternatives
- consider treatment costs and consider tailoring treatments for different herd groups, e.g. ear-tag the most vulnerable animals i.e. herd bulls
- be careful when using pesticides that could affect dung beetle populations; monitor dung pats regularly for dung beetle activity.

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**Buffalo Fly**

Harmony James, formerly DRDPIFR Tennant Creek

**Buffalo fly** (*Haematobia exigua*) irritate cattle, interrupt feeding and cause sores, especially when infestations are high. Trials in the wet tropics have shown that buffalo fly can reduce beef cattle liveweight gain by up to 16%. A small parasitic worm is associated with buffalo fly bites and causes skin lesions. Sores from buffalo fly infestations result in permanent hide damage, decreasing the value of the hide. Lesions may restrict access of stock to the live export trade.
Chemical control of buffalo flies (from Sibson 2011)

<table>
<thead>
<tr>
<th>Method</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Backline sprays</strong>&lt;br&gt;SP/OP</td>
<td>Gives instant relief&lt;br&gt;Treatment can include tick control</td>
<td>Resistance to SPs is widespread&lt;br&gt;Residues if withholding period (WHP) and export slaughter interval (ESI) not adhered to&lt;br&gt;Problems with chemical concentration&lt;br&gt;Problems with thorough application</td>
</tr>
<tr>
<td><strong>Dips, sprayraces, full body spray</strong>&lt;br&gt;SP/OP</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Insecticide-impregnated eartags</strong>&lt;br&gt;OP/SP.&lt;br&gt;(Integrate with other control methods over non-peak times)</td>
<td>Effective up to 16 weeks.&lt;br&gt;No WHP</td>
<td>Extra handling for tag application&lt;br&gt;Removal of tags before slaughter and after the designated time period&lt;br&gt;Resistance is possible if misused</td>
</tr>
<tr>
<td><strong>Dust Bag.</strong></td>
<td>Low cost&lt;br&gt;Self treatment&lt;br&gt;No WHP</td>
<td>Regulating height&lt;br&gt;Bag needs protection from rain&lt;br&gt;Animals need daily application</td>
</tr>
<tr>
<td><strong>Pour-on</strong>&lt;br&gt;SP.</td>
<td>Ease of application&lt;br&gt;Some pour-ons treat for other parasites</td>
<td>Longer ESI&lt;br&gt;Resistance to SPs is widespread&lt;br&gt;Some pour-ons may be toxic to dung beetles</td>
</tr>
<tr>
<td><strong>Backrubbers and rubbing post</strong>&lt;br&gt;OP</td>
<td>Low cost&lt;br&gt;Self treatment</td>
<td>Residues if WHP and ESI not adhered to&lt;br&gt;No control over the amount of chemical rubbed on individual cattle</td>
</tr>
</tbody>
</table>

SP – synthetic pyrethroid, OP – organophosphate, WHP – withholding period, ESI – export slaughter interval

Non-chemical treatment of buffalo flies (from Sibson 2011)

<table>
<thead>
<tr>
<th>Method</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dung beetles</strong></td>
<td>No chemicals used&lt;br&gt;Biological control&lt;br&gt;Low cost method</td>
<td>Initial establishment may be poor if dung beetles are not adapted&lt;br&gt;Only a few species may be present&lt;br&gt;New species have to be physically introduced&lt;br&gt;Dry periods reduce numbers&lt;br&gt;Killed by some broad spectrum endectocides</td>
</tr>
<tr>
<td><strong>Buffalo fly tunnel trap</strong></td>
<td>Non-chemical control&lt;br&gt;Self treatment</td>
<td>Initial cost&lt;br&gt;May need to train stock to use trap&lt;br&gt;Animals need to use the trap regularly, ideally twice a day.</td>
</tr>
</tbody>
</table>
Chemical control of buffalo fly

The development of resistance is a constant concern when using chemicals, especially when using synthetic pyrethroids (SPs) rather than organophosphates (OPs). Correct application rates of products registered for buffalo fly control are critical to preventing the development of resistance. If products are used according to manufacturers’ directions, the amount and concentration applied should be sufficient to control susceptible populations of buffalo fly. Failure to observe the directions in regard to mixing rates and/or application method can lead to the application of sub-lethal levels of the active ingredient, increasing the likelihood of resistance developing in the buffalo fly population. Higher than recommended rates increases the risk of chemical residues in meat products. Strictly observe the withholding period (WHP) and export slaughter interval (ESI) for any treated cattle.

Where chemical control is considered necessary, fly numbers should be monitored. Delay treatment until fly worry is obvious on focus animals (those most susceptible to flies, e.g. bulls) or until animals are carrying more than 200 flies each (100 on each side). Use a self-treatment method such as back rubbers, a dust bag or insecticidal ear tags during the peak buffalo fly season. Buffalo fly are most problematic from the onset of the wet season until the cooler months of the dry season.

Buffalo fly tunnel traps are a non-chemical treatment method. They have proven to work under more intensive operations with well controlled waters and small paddocks. On larger extensive properties, their success is limited by the difficulty of large paddocks, uncontrolled waters (especially during the wet season when flies are most prevalent) and training cattle.

SUMMARY OF BEST PRACTICE

- Assess the level of fly infestation and the economic benefit of buffalo fly control.
- Promote dung beetle friendly practices.
- Use non-chemical control methods wherever possible.
- Where chemical control is necessary, monitor fly numbers and delay treatment of beef cattle until fly worry is obvious on the focus animals or until animals are carrying more than 200 flies each (100 on each side).
- If necessary, use opportunistic spray treatments when cattle are in yards for other husbandry purposes and there are excessive fly numbers on cattle.
- Strictly observe withholding period (WHP) and export slaughter interval (ESI) for any treated cattle.

Sources
MLA (2003). Recommendations for integrated buffalo fly control, MLA.

Further information
WHP and ESI

Related topic
Animal Welfare.


Clostridial Diseases
Harmony James, formerly DRDPIFR Tennant Creek

Blackleg, tetanus, botulism, malignant oedema, pulpy kidney and black disease are all clostridial diseases and are amongst the most common causes of death of cattle in Australia. In all cases unvaccinated stock contracting any of these five diseases have very little chance of recovery. Botulism is by far the most important Clostridial disease in the Top End region, followed by tetanus. Deaths associated with other Clostridial diseases are reported infrequently.

Cause
Clostridial bacteria cause disease through the production of highly poisonous toxins. Minute amounts of these toxins will kill cattle. The clostridial bacteria which cause these diseases form spores, which are resistant to many environmental conditions and can persist in the soil for years. Clostridial bacteria are also found to exist in the gut contents of healthy animals.

Blackleg (Clostridium chauvoei)
- Usually affects young, fast-growing cattle.
- Bacteria may enter muscle through small wounds or after bruising.
- Symptoms: fever with gassy swelling at the site of infection; or sudden death.

Tetanus (Clostridium tetani)
- Infection usually enters via a deep puncture wound or from dehorning and castration wounds.
- Symptoms: muscle stiffness and tremor; whole body rigidity; protrusion of the third eyelid; convulsions and death.

Note: Tetanus antitoxin should be used to provide immediate temporary protection if castrating or dehorning cattle that are not already vaccinated with tetanus toxoid.

Malignant oedema (Clostridium septicum)
- Usually caused by infection of a deep wound.
- Symptoms: swelling at the site of infection; fever; muscle tremor and weakness; and death within 48 hours.

Enterotoxaemia or ‘pulpy kidney’ (Clostridium perfringens type D)
- Usually affects calves when conditions in the gut favour rapid growth of the bacteria ie. introduction of grain rations.
- Often associated with bloat.
- Symptoms: bellowing, mania, diarrhoea, convulsions, paralysis, blindness or sudden death.

Black disease (Clostridium novyi type B)
- Usually occurs in cattle with liver fluke.
- Symptoms: severe liver disease, which is highly fatal within one–two days.
- Liver fluke is not present in the NT.

Clinical signs
- Cattle are usually found dead.

Diagnosis
- Characteristic clinical signs or post-mortem examination of recently deceased cattle.
**Prevention and control**

Treatment is difficult and rarely successful so prevention with vaccination is highly recommended. The ‘7in1’ vaccine provides combined protection against the five main clostridial diseases and two strains of Leptospirosis. This should only be used in replacement heifers due to cost. Alternatively, a ‘5in1’ vaccine for only the five clostridial diseases can be administered to all calves and weaners. Many producers use the ‘5in1’ to prevent tetanus during castration, dehorning and branding. The botulism vaccine is not included in the standard clostridial vaccines. A separate bivalent vaccine for botulism is available. With costs around 20c/head (2007) for the ‘5in1’ vaccination, the cost of vaccination is likely to outweigh the cost of mortality.

**Post-mortem**

Post-mortems should be carried out promptly if clostridial disease is suspected, as diagnosis may be more difficult as time progresses. Laboratory results are not usually diagnostic.

**SUMMARY OF BEST PRACTICE**

- Vaccinate against clostridial disease with a ‘5in1’ or ‘7in1’ vaccine as early as possible and certainly at castration and dehorning if not previously vaccinated.
- Determine the cause of death if clostridial diseases are suspected to be a significant cause of mortality.

**Further information**

*Clostridial diseases in dairy cattle.*

**Related topics**

Botulism, Tetanus, Vaccination.
Coccidiosis

Susanne Fitzpatrick, DoR Darwin

Cattle producers should be aware of the potential infection of coccidiosis (black scours) in weaners, which can cause significant setback and death. While every effort should be made to reduce the risk, the problem can be managed.

Cause of Coccidiosis

Coccidiosis is a parasitic infection that can affect all domestic animals. Eleven species of coccidia have been identified as affecting cattle in Australia. However, only two cause disease in cattle – *Eimeria zuernii* and *Eimeria bovis*. Oocyst build-up occurs through faecal contamination of the soil through continual usage of calf/weaner compounds.

It is mostly seen in calves and weaners under stress and in confined areas. It usually occurs in cattle up to 250 kg liveweight at/or soon after weaning. The coccidia can be found in the gut of most animals. The profuse, dark diarrhoea results in dirty tails and hindquarters.

Clinical Signs

- sudden onset of severe, foul-smelling diarrhoea which may be blood-tinged (black or red) and may also contain shreds of mucus
- dirty tail and stained hindquarters
- straining
- anaemia and dehydration
- decreased appetite
- depression and death.

Once an animal becomes badly dehydrated and goes down, it will often die. Downers should be considered for euthanasia. Animals may require a long period of convalescence to recover from an infection if their weight gain and feed consumption are poor. Some may recover without treatment and some may be infected but not show any signs of disease. Cattle develop immunity only to the species of coccidia that infected them.
Diagnosis

Diagnosis can be confirmed by contacting the Senior Field veterinary Officer or Regional Livestock Biosecurity Officer. Samples of fresh faeces will be taken.

Prevention, control and best practice management

- feed weaner pellets or supplements containing an ionophore antibiotic, such as monensin, lasolacid, narasin or salinomycin.
- reduce stress and overcrowding young stock
- do not confine to yards or small paddocks for long periods
- place feed and water troughs above the ground to avoid faecal contamination.
- Control is quite easy if diagnosed early.

Treatment

If an outbreak occurs:

- affected animals should be separated from the others and treated with prescription medicine
- overcrowding should be reduced
- feed and water troughs should be high enough to prevent contamination with faeces
- electrolytes can be added to the water
- medicated feed with an ionic antibiotic should be used
- high quality, highly digestible feed suitable for the age/weight of the animals should also be provided to ensure the best possible nutrition
- once a calf has developed severe scours, successful treatment is very difficult – drenching with electrolyte mixtures will increase the chances of survival
- an emergency homemade electrolyte mixture can be made by mixing 1 teaspoon table salt, ½ teaspoon baking soda and 125 mL glucose in 1.2 litres of water
- Amprolium, Sulphadimidine, Sulphaquinoxaline products prescribed by a veterinarian can be used for treatment.

SUMMARY OF BEST PRACTICE

- Routinely use medicated feed or supplement for weaners, particularly in times of stress. Always use it in calf rearing and weaner feedlotting programs.
- Manage an outbreak with medicated feed or supplement and good general nutrition.
- Consider intensive treatment for severe cases such as drenching with electrolytes.
- If prognosis is poor, consider euthanasia.
- Consider changing weaner handling locations if you have suffered an outbreak.

Source

Further information
MLA Cattle Parasite Atlas.

Related topics
Weaner Management, Poddy Calves.
Disease Investigation

Susanne Fitzpatrick, DoR Darwin

Biosecurity of the Northern Territory cattle industry relies heavily on pastoralists’ observations and reporting and follow-up disease investigation.

Look, check, ask a vet!

DPI&F animal biosecurity staff provide an extension service to pastoralists to identify and confirm the presence of disease in livestock. Disease events should be reported to your Senior Field Senior Field Veterinary Officer or Regional Livestock Biosecurity Officer, who will follow up with a disease investigation. A comprehensive investigation can only be done when the event is reported early and there are clinical cases to examine and autopsy.

What should producers do if they have sick or dead livestock?

Always contact your Senior Field Senior Field Veterinary Officer or Regional Livestock Biosecurity Officer or call the Disease Watch Hotline on 1800 675 888.

SUMMARY OF BEST PRACTICE

Look, check, ask a vet.

Source

AusVet Animal Health Services.

Further information

Disease Watch Hotline Ph: 1800 675 888.

Related topics

Emergency Animal Diseases, Zoonoses, Poisonous Plants.
Nutrition

Commercial preparations of food for working dogs are available at local rural merchandise stores. These products usually provide an adequate nutritionally balanced diet. Manufacturers’ instructions should be followed for feeding. Most station dogs also receive raw bones which are essential to maintain healthy teeth.

Feeding management of bitches during pregnancy and lactation is important to provide adequate nutrition. Feed intake should be increased to 1.5 times maintenance 2–3 weeks prior to whelping, doubled in the second week of lactation and tripled in the third and fourth weeks of lactation. Feed intake should then be reduced. Several small meals a day should be provided during the late stages of gestation and early lactation. Calcium supplementation is not necessary if the bitch is receiving a high quality, well balanced commercial diet. Pups can be introduced to semi-solid foods from 3–4 weeks and dry food from six weeks of age.

Internal Parasites

Intestinal worms

Dogs should be medicated every three months to prevent intestinal worms. There are a variety of products available. It is important to read the product label to ensure that it treats ALL intestinal worms.

Bitches should be wormed at mating, one week prior to whelping, 2–3 weeks into lactation and again at weaning. Pups should be wormed at 2, 4, 6, 8, and 12 weeks of age, and then three-monthly.

Roundworm (Toxocara sp.)

Pups (4–6 weeks) are commonly infected and present with a pot belly, occasional vomiting and diarrhoea and ill thrift. Pups can be infected through the placenta, milk or by ingestions of the worm egg. Worms can be seen in the expelled faeces or vomit. CHILDREN can be infected.

Tapeworm (Dipylidium caninum, Echinococcus granulosus-Hydatids, Toenia sp.)

Scooting along the ground on the anus is a good indication of infestation. Dipylidium caninum tapeworm is transmitted by dogs or CHILDREN ingesting infected adult fleas.

Hookworm (Ancylostoma sp.)

Disease usually occurs in the first few months of life as most dogs develop immunity as they mature. Infection results in anaemia and black or bloody diarrhoea in pups. It is common and both the bitch and pups should be treated every two to three weeks during the suckling period. Humans can be infected.
Whipworm
Whipworms are not a problem in pups under three months of age. They are one of the most common causes of diarrhoea in adult dogs. Worm eggs can survive in the environment for up to five years.

Zipper worm (Spirometra erinacei)
These are common in feral pigs. The adult tapeworm can be found in dogs. The zipper worm has a complicated life cycle involving two separate intermediate hosts which are usually associated with bodies of fresh water (water).

Heartworm
Heartworm is caused by Dirofilaria immitis and spread by mosquitoes. It causes significant disease in Northern Australia. Symptoms of disease start as lethargy following work, a slight cough and loss in condition and progress to coughing blood, collapse and accumulation of fluid in the abdomen as a result of heart failure. Pups can be started on heartworm medication between 1–3 months of age depending on the product. Preventative medication can be given in the oral form daily, in the oral or injectable form monthly or the injectable form annually. Ivermectin is not registered for use in dogs. (Caution: ALL collie breeds, Shetland sheepdogs, Old English sheepdogs and dogs with merle-coloured coats or blue iris can be sensitive to ivermectin).

External Parasites
Ticks
Dogs are host to 12 species of tick, however only the brown dog tick (Rhipicephalus sanguineus), cattle tick (Boophilus microplus), and wallaby tick are seen regularly on dogs in the NT. The paralysis tick (Ixodes holocyclus) is not present in the NT. It causes significant illness and death of dogs in coastal areas of eastern Australia. The brown dog tick is a vector for Babesia canis which can cause tick fever in dogs. Ticks occur frequently in the wet season. Tick collars worn in close contact with the skin can kill ticks for up to five months. Acaracide washes and spot-on or spray medications are also used.

Fleas
(Ctenocephalides felis felis, Ctenocephalides canis)
Fleas can cause uncontrollable itching (flea allergy dermatitis or FAD), anaemia, and are host to tapeworm. Fleas require humidity (70–80%) and warmth (18–35 °C), but flea larvae will not develop in direct sunlight. Fleas are most commonly found in cracks and crevices and dark shaded areas, where flea eggs can survive up to one year. Flea control must be aimed at control on the dog and around its environment. Ensure that the treatment products control both the adult flea (adulticide) and the larvae (insect growth regulator or IGR).

Mites
Mites cause mange. There are two main types of mange which result in hair loss: sarcoptic mange (Sarcoptes scabiei) and demodex mange (Demodex canis). Sarcoptic mange is highly contagious and causes severe itching. All in-contact dogs and bedding need to be treated with an acaricide wash. Demodex is a normal mite found in the skin, but some dogs have more than other dogs which predispose them to disease. It is not contagious and generally does not cause itching, but pups can be affected on their muzzle and paws when suckling infected bitches. There is a localised form affecting specific regions of the body, commonly the face or the forelegs or a generalised form affecting the entire body. The disease can occur in juveniles (3–18 months) or adults and can be confined to the feet. It is important to diagnose this mange as treatment programs are case specific. A skin scrape at your local vet is generally diagnostic.

Vaccination
It is highly recommended that all dogs are protected against core infectious diseases: parvovirus, distemper, and hepatitis (with C3 vaccination) and tetanus. While it is not yet common that dogs be vaccinated for tetanus, many veterinarians now recommend it. The kennel cough vaccine is generally required for kennelled dogs. Pups are protected against disease for the first six weeks of age by maternal antibodies received in colostrum from the vaccinated mother. Vaccinate bitches 1–2 months before mating to ensure the maximum immunity is passed on in the colostrum. Pups should then be vaccinated to provide active immunity to infection. Pups can be vaccinated with a three-shot program at 6–8 weeks, 12–14 weeks and then at 16–18 weeks of age or a two-shot program at 10 weeks and then 14–16 weeks of age. Pups should not have ANY contact with dogs outside the station until they have completed their vaccination program. All dogs should receive a booster shot annually.

Canine Parvovirus
This viral disease causes severe vomiting and diarrhoea with blood, which results in dehydration. It is spread by infected faeces. Death can occur within 24 hours. This is a common disease in pups in the Top End region, but can also affect older dogs. Dogs infected with hookworm are more susceptible to the disease.

Canine Distemper
This highly contagious viral disease causes respiratory, digestive and nervous signs and causes death in up to 50% of unvaccinated dogs. Dogs present with depression, fever, loss of appetite and discharge of pus from the eyes and nose. It can progress to pneumonia, vomiting and diarrhoea and convulsions. Dogs that do recover may have permanent brain damage. It is spread by discharge from the nose and eyes of infected dogs. This disease is re-emerging in the Top End region as the incidence of unvaccinated dogs increases.
**Infectious Canine Hepatitis**

This disease is also characterised by depression, loss of appetite, and diarrhoea. In addition dogs can develop tonsillitis and abdominal pain due to an enlarged liver. Severely affected dogs can die within 36 hours, whereas mildly affected dogs show lethargy and depression. Following infection, the cornea of the eye can become opaque in colour (blue eye).

**Kennel cough (Canine Parainfluenza Virus, Canine Adenovirus Type 2 and Bordetella brochiseptica bacteria)**

Together, these diseases contribute to kennel cough syndrome. The syndrome results in respiratory symptoms such as a dry hacking cough, nasal discharge and fever. The cough can be controlled with a teaspoon twice daily of ‘Medihoney’ and in severe cases antibiotics and cortisone to relieve the cough.

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**SUMMARY OF BEST PRACTICE**

- **Vaccinate against core infectious diseases**: parvovirus, distemper and hepatitis (with C3 vaccination) and tetanus.
- **Manage parasites** as necessary. Worm regularly.
- **Hygienic accommodation will provide less places for external parasites to lodge and will assist in parasite control and prevention.**

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**Further information**

DPI&F Senior Field Veterinary Officer, Darwin. Ph: 8999 2035.

**Related topics**

Zoonoses, Working Dogs.
Emergency Animal Diseases affect all livestock industries.

The Australian livestock industry benefits enormously from being free of many diseases that devastate animals in other countries. Any introduction of these diseases could have a catastrophic impact. Several committees have developed plans and trained people to monitor and eradicate any outbreak of these diseases.

What is an EAD?

Emergency Animal Diseases (EAD) are those diseases likely to have a significant effect on livestock, causing mortalities and production loss. They may also have a serious impact on human health and the environment. These diseases are categorised as exotic (brought in from overseas), emerging (new diseases originating in Australia) and endemic (already present here). Many of these diseases are notifiable in the NT.

Owners, managers, agents and veterinarians who suspect or have confirmed laboratory results of notifiable diseases must report them to the Chief Veterinary Officer. A list of notifiable diseases and the reporting form is available on the DPI&F website.

The NT has the potential to be the first point of entry for many exotic diseases that can affect animals, plants or people. DPI&F has a Biosecurity Management Response Plan for dealing with exotic pest and disease outbreaks and other emergencies.

Livestock Industry and Community Awareness

One objective of the Emergency Animal Disease Preparedness (EADP) Program is to ensure the community and the livestock sector are informed of and alert to the impact livestock diseases could have on the Australian economy, and are capable of responding in a coordinated manner to any incursion or outbreak. This program is designed to maintain producers’ awareness of the importance of emergency animal diseases and the appropriate action to be taken when one is suspected. For more information, visit the Animal Health Australia website.

What should you do if you see a sick animal or suspect an outbreak of an emergency animal disease?

- Report it to your local Veterinary Officer or Regional Livestock Biosecurity Officer.
- Keep suspect livestock on your property and isolate them from other animals.
- Remain on the property and discourage visitors until the stock are investigated.

What signs should I look for?

- unusually high numbers of sick or dead animals
- blisters, ulcers or erosions of the mouth, udder or feet
- strange nervous signs
- bloody diarrhoea.
Emergency Animal Diseases to watch out for:
Foot and Mouth Disease
BSE
Screw Worm Fly
Rabies
Australian Bat Lyssavirus
Bovine Tuberculosis
Japanese Encephalitis
Surra
Rinderpest

Foot and Mouth Disease (FMD)
Foot and Mouth Disease (FMD) is a highly infectious virus affecting cloven hooved animals (not horses). Symptoms include fever, depression, and blisters on the mouth, tongue, udder and feet. These blisters can cause drooling from the mouth and lameness. The virus is spread by contact with infected animals or contaminated environment, feed, clothing or vehicles. Early detection is vital for successful control and eradication.

Screw Worm Fly (SWF)
Screw Worm Fly is a parasitic fly (Chrysomya bezziana) that affects warm-blooded animals including cattle and horses. The fly lays larvae (maggots) in open wounds which feed on blood causing destruction of tissue. The SWF national surveillance program monitors larvae collected from open wounds on livestock in northern Australia. The introduction and establishment of SWF would result in massive production losses to livestock industries.

SUMMARY OF BEST PRACTICE
• Be aware of EADs.
• Report any animals suspected to have an emergency animal disease.
• Isolate diseased animals.
• Discourage movement onto and off the property.

Further information
Animal Health Australia.
Emergency Disease Hotline 1800 675 888.
Related topics
Animal Welfare, Zoonoses.
Heat Stress in Cattle

Jessica Mayes, formerly DPIFM Katherine and
Harmony James, formerly DRDPIFR Tennant Creek

The risk of heat stress in the Northern Territory is significant.

To reduce the risk of heat stress, consider cattle selection, facilities and management.

Heat stress occurs when an animal has excess body heat that it cannot lose. Heat-stressed cattle will:

- eat and ruminate less
- seek shade or align themselves with the sun if there is no shade
- breathe with their mouths open, pant, salivate and splash water if it is available
- become unresponsive, lie down and start to die when their body temperature reaches 41.5 °C.

Minimising production of excess body heat

- Cattle with quiet temperaments are less likely to become excited (stirred up) and less likely to overheat. Steady mustering and quiet handling reduces the chance of cattle becoming stirred up.
- Efficient facilities promote the smooth flow of stock during handling and reduce the chance of cattle becoming stirred up.

Improving loss of excess body heat

- Adapted cattle have genetically determined physical features to better suit an adverse environment. For example, tropically adapted cattle have shorter coats, longer dewlaps and more sweat glands to help lose body heat.
- Acclimatised cattle have seasonal adaptation to better suit an adverse environment. For example, cattle with a hairy winter coat will lose it before summer.
- Lean body condition increases the ability to lose heat. Fat cattle have a greater risk of heat stress because excess body fat acts as insulation and slows body heat loss.
- Rest gives cattle an opportunity to settle down, decrease production of body heat and increase heat loss. Rest can be especially important after helicopter mustering.

Reducing the risk of heat stress

- Shaded yards protect cattle from the heat of the sun. This is particularly important for British and European types of cattle. The shade must not interfere with the air flow through the yards.
- Cool, fresh water reduces the risk of heat stress. Buried water pipes and shaded troughs ensure delivery of cool water to cattle.
- Spraying or use of sprinklers help cattle lose excess body heat through evaporative cooling if humidity is below 50%.
- Room in yards and pens allows cattle to spread out. This maximises air flow and heat loss.
- Appropriate and efficient yard design will reduce the stresses on cattle and likelihood of heat stress.
- Handling during cool hours will reduce body heat build-up.
- Travelling during cool hours and after dark will reduce body heat build-up.
prevent overloading of trucks to optimise air flow and heat loss.

Shaded lower truck decks can provide protection for cattle that are more susceptible to heat.

Electrolytes may be provided to help cattle replace body salts and fluids lost during mustering and transport.

Avoid working cattle during periods of extreme heat and humidity.

Give extra consideration to:

- Cattle recently vaccinated for tick fever. These animals can develop a reaction after vaccination as a normal part of developing immunity. If possible, consider giving vaccination well before transport, to allow recovery from any reaction.

- Cattle travelling into hotter and more humid conditions. Transporting cattle from cool, dry areas to hot, humid areas markedly increases the risk of heat stress.

**SUMMARY OF BEST PRACTICE**

- Recognise that heat stress can be a problem in the Northern Territory environment.
- Provide shade and cool, fresh water.
- Select for quiet, tropically adapted cattle.
- Avoid mustering, working cattle and transporting when excessively hot.

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Source

Further information
Rural Chemical Industries (Aust.) PL.
http://www.heatstress.info/

Related topics
Animal Welfare.
Horse Health

Susanne Fitzpatrick, DoR Darwin and Peter Trembath, Katherine Vet Care Centre

Horse care can be time-consuming and expensive. Adequate nutrition, husbandry measures and a clean, safe environment will minimise problems, however there is always a risk of diseases, parasites, poisoning or other ailments.

Nutrition

Horses are monogastric animals (one stomach) and fermentation occurs in the caecum and large intestine where large numbers of micro-organisms digest cellulose, utilise protein and non-protein nitrogen and synthesise certain vitamins.

Pasture and hay

Legume-grass mixes contain considerably more protein, minerals and vitamins than grasses alone. Amiga and Verano Stylos and Cavalcade, can be combined with introduced grasses to achieve a top pasture. In sandy areas where pasture is short due to overgrazing, horses should be provided with supplemental roughage. Pasture and hay should be free of weeds. Old, excessively mature growth has less nutritive value than fresh, young growth. Mouldy hay should not be fed to horses because it can cause colic, laminitis and death.

Concentrates and other supplements

These include grains and by-product feeds high in energy and protein. Processing of grains before feeding is often desirable to improve nutrient availability and increase bulk, but grains that are cracked or rolled may become stale and/or mouldy. Over-gorging on grain can be catastrophic, leading to rupture of the stomach and certain death. Care should be taken to ensure horse don’t have free access to open bags of grain on the backs of station vehicles, at the poultry shed or around the stable. Ensure the latches of silos are securely locked as inquisitive horses can sometimes open them.

If a large volume of undigested grain reaches the lower gut, excessive fermentation will occur and can predispose to colic or grain founder (laminitis). If concentrates are to be fed, they should be fed only small amounts and gradually increased over a period of weeks. In the event of grain overload, drench the horse with sodium bicarbonate and provide anti-inflammatory such as phenylbutazone if any is readily available. Seek urgent advice from a veterinarian if the horse is valuable.

Horses must not be fed more than 2.5 kg grain in a single feed and should not be fed grain before exercise or transport. Dusty feeds should not be fed because they can lead to or aggravate respiratory problems. An artificial supplement feed can be made by soaking a dry ingredient with water and molasses.

Monensin is toxic to horses and care should be taken not to allow horses access to any stockfeeds such as weaner pellets or feedlot mixes that contain it (i.e. Rumensin®).
**Water**

Water requirements depend largely on environment, the amount of work or physical activity, nature of the feed and physiological state of the horse. Daily consumption by an adult horse is typically 3.3 L/100 kg body weight. Water requirements could range from 20 to 60 L/day. Clean, fresh water should be provided ad lib for all horses. Ensure that trough water is not too hot by checking the temperature with your hand. Hot horses should be allowed to cool down before being given unlimited access to cold water. Small amounts of room-temperature water should be offered frequently while the horse is cooling down.

**Salt**

Horses should have access to salt, particularly when there is increased sodium loss through sweating. Horses in the Northern Territory should have access to a lick block throughout the wet season at least, but preferably year-round. Horses will seek out a salt block if they need it, so if your horse shows no interest, this is the best indication that the salt balance in their diet is adequate.

**Calcium and phosphorus**

Horses grazing introduced tropical pasture species such as buffel grass, Kazungula setaria and pangola grass, may require a calcium supplement in their diet. This applies primarily to foals and pregnant or lactating mares that have a higher requirement for calcium to supply the needs of growing bones and milk production. These grasses contain calcium as calcium oxalate. Cattle can metabolise this into usable calcium, but horses cannot. It can lead to 'Big Head' in horses. Feeds that are relatively high in calcium include lucerne, sunflower and linseed meals, calf manna (highly palatable and digestible protein and energy supplement), and molasses. Alternatively, powdered calcium supplements may be mixed with molasses.

**Vitamins**

Horses with access to green pasture and sunshine are unlikely to suffer from vitamin deficiencies. However, in the dry season when pasture availability and palatability is low, most horses will require supplementary feeding. Where possible, this should include some quality green feed, or even grazing a lawn for a short period each week to meet their vitamin requirements. In cases of severe malnutrition, vitamin supplements may be required.

**Protein and carbohydrates**

Quality hay meets most of a horse's nutritional needs. Horses with a higher demand for protein and carbohydrates (horses working hard), and those fed poor quality hay will require additional grain feeding.

**Sand**

Ingestion of sand when grazing depleted pastures at the end of the dry season causes ill-thrift, diarrhoea and colic. Prevent by feeding sandlube weekly and supplementary feeding hay or by not overgrazing the horse paddock.

**Poisonous plants**

Several species of *Crotalaria* (rattlepods) occur in the Top End region. Some of these species contain pyrrolizidine alkaloid toxins which damage the liver. The 'walkabout' syndrome is characterised by depression, blindness and a staggery gait, often with weight loss. Liver damage is cumulative and irreversible, and death can be sudden. This syndrome is untreatable and affected horses should be euthanized. Diagnosis can be difficult, but it is usually based on clinical signs or a blood test for liver function. Prevention is the key. Do not overgraze paddocks, always supplementary feed in the late dry season and do not allow access to paddocks containing rattlepod.

**Parasites**

**Internal Parasites**

All horses can harbour different types of worms but foals are more susceptible to large infestations especially after stressful incidents such as weaning, disease or transport. Commonly found types include bloodworms (*Strongylus* sp.), roundworms (*Parascaris* sp.), pinworms (*Oxyuris equi*), hairworms (*Trichostrongylus axei*), tapeworms (*Anoplocephala* sp.) and redworms (*Cyathostomes*). Foals born during or close to the wet season and kept on pasture should be wormed monthly from six to eight weeks of age to six months.

The general recommendation for station horses is to treat them at the start and finish of the working season (immediately after and before the next exposure to worm larvae on pasture). To prevent the development of worm resistance to a particular class of chemical it is recommended that you alternate the active ingredient in the drench. As the majority of the worm population is on the pasture, coordinate treatment with fresh paddocks if possible. The minimum worming regime is to worm with ivermectin at the end of the dry season and to use a fenbendazole (e.g. Panacur®) at the end of the wet season.

Bot flies (*Gasterophilus* sp.) are not seen in the Top End, so it is not considered necessary to use a wormer that kills bot fly larvae. Horses imported from Queensland and more southern climates should have one treatment for bots on arrival in the Northern Territory.

**External Parasites**

**Ticks**

Tick worry occurs in horses imported from cooler climates. Ticks can be easily treated with oral, injectable or topical application of parasiticides.

All horses travelling south of the tick line must be inspected and sprayed for cattle tick by a Regional Livestock Biosecurity Officer to ensure that ticks are not spread to designated ‘clean’ areas. NB Horses can not be treated with Amitraz.
Fly larvae (Habronema and Draschia sp.)

Fly larvae may burrow under the skin, causing ‘summer itch’, small hard lumps and non-healing sores. The larvae may also complicate or prolong the healing of other wounds and contribute to ‘proud flesh’. Infection with Onchocerca sp microfilariae typically causes formation of hard but usually fairly un-reactive lumps, commonly in the neck or brisket. Treatment with a parasiticide such as Ivermectin may cause lumps which become worse shortly after treatment, owing to the death of the insect larvae. This sometimes causes itching which needs to be treated with cortisone. However, once the larvae are dead they are easily removed by the body and the sores tend to heal without further complication. Horses with a tendency to develop summer sores should be protected against biting flies by using repellants and fly veils and rugs.

Vaccination

Tetanus

Tetanus is caused by the toxin produced by Clostridium tetani, a bacterium found in the environment. The disease develops following infection of a deep penetrating wound. It is often difficult to locate the injury, which may be due to a nail prick when shoeing. The toxin invades the central nervous system and causes severe muscle spasms, rigidity of the body, extreme sensitivity to noise, and always results in death. The early signs are an anxious expression of the third eyelid becoming quite prominent in the corner of the eye. The disease is untreatable but easily preventable.

The Darwin region is considered to be a high-risk area for tetanus infection and all horses should be vaccinated from three months of age. Primary vaccination consists of two doses given four weeks apart, followed by a booster vaccination one year later, and then every three years for life. Unvaccinated horses that are wounded by a penetration through the skin or undergo surgery such as castration should be given tetanus anti-toxin for short-term protection (seven days) and placed on a vaccination program. Prevention costs $10. Treatment costs $1000 and is rarely successful.

Strangles

Strangles is a bacterial infection caused by Streptococcus equi subspecies equi, mostly seen in young horses kept together in large groups. The infected animal is feverish, off its food and usually has a thick mucous discharge from the nose that may or not contain pus. The glands between the angle of the jaw and the throat (sub-mandibular lymph nodes) swell up and abscesses usually form. If an abscess fails to rupture, the airway may become slightly occluded, causing breathing problems.
The Top End is not considered a high-risk area for strangles infection but cases have been confirmed throughout the NT, especially during the campdraft season. The disease is contagious and is usually introduced to a population by an infected horse. Primary vaccination consists of three doses given two to four weeks apart, followed by annual boosters. Horses with severe lameness is due to hoof problems. The most common hoof problems are abscesses in the sole, stone bruises and seedy toe during the wet season. They are relatively simple to treat but need prompt attention. The abscessed tissue is usually cut away to allow release of the pressure that causes pain. Stone bruises usually require time to heal. CORRECT SHOEING IS IMPORTANT.


Seasonal hoof problems include cracking of the hoof wall in the dry season. There are many hoof oils and dressings available that can be wiped or brushed on to the coronary band (periople) of the hoof to maintain suppleness that helps avoid cracking. In the wet season the opposite problem can occur, particularly if horses spend long periods standing in mud or water. The hoof wall softens and becomes more susceptible to penetrating injuries from stones and nails, sometimes leading to bruising and abscess formation. Water-excluding dressings such as Stockholm tar applied when the hoof is dry, and feed supplements such as gelatin or biotin additives may help to avoid these problems. Formalin treatment of infected soles is effective in the wet season.

Greasy heel caused by Dermatophilus congolensis bacteria also can occur in horses that live in warm, wet and muddy environments. Greasy heel appears on the horse’s heels as a scab or knotted hair that when removed reveals a greasy grey or yellowish and inflamed area. White horses or horses with white feet are particularly susceptible. It can be prevented by trying to provide a dry area in the paddock or erecting a shelter. Antibiotics and topical treatments may need to be applied.

Other

Swamp Cancer

This is not a cancer as such, but a severe, deep-rooted fungal (Pythium fungus) infection that generally arises from a fly or tick bite and is rarely associated with a traumatic wound. It is generally seen in horses grazing wet, poorly drained, swampy areas. Horses in these ‘infected’ areas may suffer severe, life-threatening illness year after year. The lesions are raised and discharge a bloody mucoid substance. They are very painful and the horse often bites at the lesion and has blood on the muzzle area. Lesions can be on the body, legs or head. If the lesions are diagnosed early enough treatment is generally successful. Treatment includes surgical excision, intravenous and oral iodine, Pythium vaccination and topical iodine. Severe cases are difficult to treat and horses are often euthanized.

A condition often referred to as a swamp cancer is ulceration of wounds during the wet season caused by burrowing larvae of the habonema fly. This condition is easily treated.
**Sarcoid**
These are seen commonly in the Top End region. They look like a malignant cancerous wart and are caused by a papilloma-type virus. Treatment is by excision, cryosurgery and topical medications. Recurrence is common. Speak to your vet about treatment options.

**Eye Ulcers**
These are usually in one eye during the wet season caused by traumatic damage to the cornea and/or bacterial infection. Always check in the eye for grass-seeds. Flush eye with saline, apply antibiotic ointment twice daily and cover the eye to protect from the sun, dust and wind.

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**SUMMARY OF BEST PRACTICE**

- Handle all foals at weaning to the stage of being tied up. Treatment of unhandled horses can create more problems than it solves.
- Provide horses with a quality diet, and supplement when necessary.
- Avoid grazing horses on pastures infested with crotalaria. Crotalaria plants in the horse paddock should be hand-pulled or spot sprayed with a herbicide.
- Treat all station horses for internal parasites at the end of the wet season, and again at the end of the dry season.
- Commence a tetanus vaccination program for foals when they are weaned and first handled.
- Provide tetanus anti-toxin and tetanus vaccine to unvaccinated horses with penetrating skin wounds or surgical procedures. Maintain booster vaccination.
- To avoid strangles infection, segregate the station horses at campdrafts from those of other stations, and avoid sharing of water containers.
- Check teeth and feet regularly.
- Ensure horses DO NOT get access to stockfeed and supplements that contain monensin. Urea is also toxic.

**Further information**
DPI&F Stock Course, contact Pastoral Extension Officer, DPI&F Katherine, Ph (08) 8973 9763


Australian Farriers and Blacksmiths Association

**Related topics**
Tetanus, Poisonous Plants.
Leptospirosis
Susanne Fitzpatrick, DoR Darwin

In cattle herds, leptospirosis can result in reduced branding percentages. The disease can cause abortion, stillbirth, weakness and death in young calves when non-immune cattle are infected during late pregnancy. Leptospirosis is generally widespread in the Top End Region. Livestock workers can contract leptospirosis from infected cattle, either by direct contact with infected urine when handling cattle, or indirectly through contact with contaminated water and soil. Leptospirosis in humans is a debilitating and sometimes prolonged disease which commences with severe flu-like symptoms and severe kidney (back) pain. It is a notifiable disease in humans.

Cause
Leptospirosis is caused by *Leptospira interrogans* subspecies *hardjo* and *pomona* bacteria. Transmission of *L. pomona* in cattle mainly involves contact with urine of pigs and commonly occurs in wetter areas with feral pig populations.

Clinical signs in cattle
- abortion
- fever
- depression
- jaundice
- anorexia.

Diagnosis
- Collection of:
  - duplicate blood samples from 20–30 cows four to six weeks apart
  - urine sample
  - blood, liver, kidney, spleen from foetus.
- Post-mortem shows:
  - yellowing of tissues
  - dark kidneys with haemorrhages.

Prevention and control
Vaccination is not a routine management procedure in the Top End region, but may be considered in a risk-based approach to preventing infection among livestock workers. Vaccines are available as ‘7in1’ with clostridial vaccines or as a bivalent leptospirosis vaccine. A booster is required four to six weeks after the initial dose, followed by an annual booster. Because the immunity provided by this killed vaccine barely lasts 12 months, it is recommended that animals be vaccinated when they are diagnosed pregnant. Reducing feral pig populations is integral to leptospirosis prevention and control.

SUMMARY OF BEST PRACTICE
- Avoid contact with urine of cattle and moist areas in the cattle environment such as muddy areas around water troughs and water holes. Leptospirosis can penetrate the membranes of the mouth, nose, eyes and broken skin. There is no vaccine available to prevent human infection.
- The risk of human infection is reduced in vaccinated herds.
- Human infection of leptospirosis is a notifiable disease.
- Reduce the feral pig population.

Source

Related topics
Vaccination, Zoonoses.
Poisonous Plants

Susanne Fitzpatrick, DoR Darwin and Jessica Mayes, formerly DPIFM Katherine

The Top End region contains numerous plant species and some fungal and algal species potentially poisonous to livestock. The source of toxin, growth phase of plant and animal, and environmental and situational factors can influence the likelihood of poisoning.

Source of Toxin

Vascular plant and algal toxins are known as phytotoxins. Fungal toxins are known as mycotoxins.

The condition of the toxic plant will affect its palatability. The toxicity of the plant can vary with growth stage. Some plants are poisonous during active growth, others during flowering or fruiting and others when wilting or drying off.

The Animal

- Rumen microflora can either detoxify or potentiate ingested toxins. For example, horses and cattle may be affected differently by a particular toxin.
- Younger animals are generally more susceptible to toxins.
- Poorly fed animals and particularly hungry animals (following transport or yarding) are more susceptible.
- Animals in poor condition or stressed are usually more susceptible because they are hungry and vulnerable.
- Stock introduced to new areas may eat poisonous plants not eaten by local stock. Hunger may compound the susceptibility of new stock. Local stock may have a tolerance to toxins.
- Length and intensity of exposure to the toxin will affect the likelihood of poisoning (i.e. how much and for how long the animal has consumed the plant).

The Environment

During dry periods some poisonous plants may remain green after pasture plants have dried off. Poisonous plants may be more attractive during these times.

- High temperatures, drizzly rain, and cloud cover can affect the amount of toxin in some plants.
- Nutrients and mineral deficiencies of the soil may affect plant toxicity.

The Situation

The likelihood of poisoning is increased when:

- Hungry cattle are released, after transport, into yards or paddocks containing toxic plants.
- Inadequate feed forces stock to consume plants or parts of plants they would usually avoid.
- Fresh growth of poisonous plants occurs following fire or rain.
- Large numbers of poisonous plants are present with little alternative feed.

What should you do if you suspect a plant poisoning?

Contact your Regional Livestock Biosecurity Officer or Senior Field Veterinary Officer.
Diagnosis

- Collect a thorough history.
- Examine sick animals and collect blood and faecal samples.
- Perform a post-mortem and collect blood and tissue samples, rumen contents samples (most important) and intestinal contents.
- Examine the environment and collect plant, fungi, feed and water samples.

### Common poisonous plants in the Top End region

<table>
<thead>
<tr>
<th>PLANT</th>
<th>LIVESTOCK AFFECTED</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birdsville Indigo</td>
<td>Horses</td>
<td>Loss of appetite, lethargy, weightloss, progressive gait incoordination, toe-dragging.</td>
</tr>
<tr>
<td>Indigofera linnaei</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blue-Green Algae</td>
<td>Cattle</td>
<td>Contain Cylindro-spermopsin, Mycrocystin, Nodularin. Sudden death, acute or chronic liver damage. Weakness progressing to collapse and death.</td>
</tr>
<tr>
<td>Button Grass</td>
<td>Cattle</td>
<td>Nitrate-nitrite poisoning occurs when hungry livestock ingest lush plant from nitrogen-rich soils near or in stockyards. Sudden death. Muscle weakness/spasms, rapid deep breathing, coma. The blood is a brown colour.</td>
</tr>
<tr>
<td>Dactyloctenium radulans</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coffee Senna</td>
<td>Cattle</td>
<td>Contains Anthraquinone glycoside. Depression, abdominal pain, jaundice, collapse, death. Liver necrosis.</td>
</tr>
<tr>
<td>Senna occidentalis</td>
<td>Horses</td>
<td></td>
</tr>
<tr>
<td>Crotalaria</td>
<td>Horses</td>
<td>Contains Pyrrolizidine alkaloid. Ulceration of the oesophagus, licking of lips, grinding teeth, drooling saliva, inability to swallow, weight loss.</td>
</tr>
<tr>
<td>Crotalaria medicaginea</td>
<td></td>
<td></td>
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<tr>
<td>Heart-Leaf Poison Bush</td>
<td>Cattle</td>
<td>Contains Fluoroacetate, (as in 1080 baits) Heart failure, collapse, convulsions, death.</td>
</tr>
<tr>
<td>Gastrolobium grandiflorum</td>
<td></td>
<td></td>
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<tr>
<td>Ironwood</td>
<td>Camels</td>
<td>Contains Diterpenoid alkaloid. Poisoning occurs in hungry newly introduced stock or with sucker regrowth. Sudden death. Undigested leaves are often found in the rumen or stomach.</td>
</tr>
<tr>
<td>Erythrophleum chlorostachys</td>
<td>Cattle</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Goats</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Horses</td>
<td></td>
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<tr>
<td>Mouldy feed</td>
<td>Cattle</td>
<td>Contains Aflatoxin.</td>
</tr>
<tr>
<td>-----------------------</td>
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</tr>
<tr>
<td>Aspergillus spp</td>
<td>Horses</td>
<td>Sudden death. Lethargy, loss of appetite, jaundice, widespread haemorrhage, liver necrosis.</td>
</tr>
<tr>
<td>Native Tobacco</td>
<td>Cattle</td>
<td>Contains Pyridine alkaloid.</td>
</tr>
<tr>
<td>Nicotiana sp.</td>
<td></td>
<td>Poisoning occurs in hungry newly introduced stock with high concentration of plant and little alternative feed.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Uncoordinated gait, muscle tremor; collapse and death. Haemorrhage throughout intestine, heart and brain.</td>
</tr>
<tr>
<td>Pigweed</td>
<td>Cattle</td>
<td>Nitrate-nitrite poisoning occurs when hungry livestock ingest lush plant from nitrogen-rich soils near or in stockyards.</td>
</tr>
<tr>
<td>Portulaca oleracea</td>
<td></td>
<td>Sudden death. Muscle weakness/spasms, rapid deep breathing, coma. The blood is a brown colour.</td>
</tr>
<tr>
<td>Rattlepods</td>
<td>Cattle</td>
<td>Contains Pyrrolizidine alkaloid.</td>
</tr>
<tr>
<td>Crotalaria nova-hollandiae</td>
<td>Horses</td>
<td>Weight loss, lethargy, jaundice, incoordination, blindness, repetitive yawning, headpressing. Horses may present with a dummy syndrome, but suddenly become manic and aggressive when restrained or handled.</td>
</tr>
<tr>
<td>Crotalaria crispate</td>
<td>Cattle</td>
<td>Contains an unknown glucoside, possibly Cycasin.</td>
</tr>
<tr>
<td></td>
<td>Horses</td>
<td>Chronic partial paralysis. Acute hepatic necrosis.</td>
</tr>
<tr>
<td>Zamia palms</td>
<td>Cattle</td>
<td>Contains an unknown glucoside, possibly Cycasin.</td>
</tr>
<tr>
<td>Cycas armstrongii</td>
<td></td>
<td>Chronic partial paralysis. Acute hepatic necrosis.</td>
</tr>
</tbody>
</table>

**SUMMARY OF BEST PRACTICE**

To prevent plant poisoning:

- Know which plants are poisonous.
- Always ensure newly introduced stock are put in ‘safe’ paddocks on arrival or have been well fed on good hay before releasing from the yards.
- Ensure weaners are ‘tailed-out’ on ‘safe’ pastures and/or put in ‘safe’ paddocks after weaning.
- Know what conditions may lead to poisoning.
- Avoid grazing of livestock in areas with poisonous plants, especially when pasture availability becomes limited.
- Where possible, remove poisonous plants, use herbicides or biological methods (insects) to their control growth and spread.
- Fence-off areas that are of particular concern, based on historical records.

**Sources**


McKenzie, R (2002). *Toxicology for Australian Veterinarians* [CDROM], University of Queensland School of Veterinary Science.

**Further information**


**Related topics**

Disease Investigation, Horse Health, Animal Welfare.
Stringhalt

Susanne Fitzpatrick, DoR Darwin

Stringhalt is a disorder of the knee-joint where the mobility of one or both hind limbs is impaired. The predisposing causes of stringhalt in cattle are not fully understood. It appears to be an inherited/environmental defect with an extremely variable ‘expressivity’ or strength of manifestation. Suggested causes include inherited anatomical problems with particular breeds of cattle (*Bos indicus*) or particular lines of breeds, physical strain or injury causing ligament damage, low levels of nutrition and deficiencies, reproduction demands and/or a combination of these factors.

Stringhalt occurs with the temporary or permanent upward fixation of the patella (knee cap) on the prominence of the femur (upper leg bone). The patella in cattle is attached by three ligaments to the tibia (main bone in lower leg). The condition occurs when the inside (medial) ligament hooks over the top of the knee, locking the hindleg in extension until the animal can disengage it. When viewed from the side, the leg is locked straight in the extended position dragging behind the animal. When the ligament is disengaged, the limb jerks forward. Initially only stiffness of the hind limbs might be observed, which progresses to the jerky action in one or both limbs and eventually to dragging of the hind limbs.

A large study in Brazil concluded that nutritional deficiency seemed to be the most important factor affecting the occurrence of stringhalt and that cows, especially those who had just calved, were more susceptible than other animals. More animals presented with stringhalt during the dry season when pastures were of lower yield and poorer quality. The disorder was observed more in animals in poorer condition. Less than 0.5% of the herd showed signs of stringhalt.

Horses in Australia can also suffer from ‘Australian stringhalt’. While not proven, it is thought to be associated with the ingestion of toxins in some pasture weeds. Recovery can take 6–12 months. An anti-convulsant drug may ease signs of the disease in horses.

**Diagnosis**

- exaggerated, spasmodic flexion of one or both hind legs
- recollection of previous stringhalt episodes
- lameness after rest
- dragging hoof or hooves which may show signs of wear as a result unusual gait
- local palpation of the joint.

Signs of stringhalt may be present in varying degrees of severity.

**Prognosis**

- While spontaneous recovery does occur, the disorder is likely to recur intermittently.
- Surgical treatments “medial patella desmotomy” are available but would not be economically warranted and should not be used in breeding animals because of the likelihood of inheritance.
- Animals with signs of stringhalt are not acceptable for live export.
SUMMARY OF BEST PRACTICE

• Cull breeding animals showing signs of stringhalt.
• Meet the nutritional needs of animals, especially cows just after calving.

Sources


Related topics
Supplementation.
Tail Rot
Susanne Fitzpatrick, DoR Darwin

For many years now, the cattle industry has recognised a syndrome known as ‘tail rot’. It can occur in all breeds of cattle, but is reported more commonly in Bos indicus breeds, especially Brahmans. It also occurs in buffalo.

Although the prevalence of tail rot in Top End herds is less than 1%, cattle with stumpy tails are rejected from live export with no alternative local market. It is of particular concern to producers when the syndrome occurs in a high proportion of cattle.

A primary cause of tail rot is not known, though bacterial, fungal and/or parasitic infections have been identified following laboratory testing on amputated tails.

Diagnosis
Tail rot is characterised by:
- hardening of skin tissue from the tail tip
- loss of hair from the brush of the tail
- gradual ‘rotting’ and loss of section of the tail
- healing with thin dark tissue covering the tail stump
- infection ‘pus’ breaking out from open wounds as the rot continues up the tail.

Cattle are at risk of septicaemia or infection entering the spinal cord causing meningitis. On occasions the infection continues to move up the tail causing paralysis of the hind legs. These cattle must be destroyed humanely.

One common cause of tail rot is trauma associated with a crushing injury which results in temporary or permanent loss of blood flow to the tail and may occur during yard work. When the blood is prevented from reaching the end of the tail, the tissues are deprived of oxygen and begin to die, turning necrotic. Dingoes or wild dogs can be significant causes of trauma to the tail.

Tail rot occurs in cattle throughout the world due to a number of diseases including ergotism, fescue foot, deg nala disease and bucopa. These diseases affect other extremities of the body including the ears, nose and feet, unlike tail rot in Australia. Further epidemiological research is required to determine the factors contributing to tailrot infection observed in North Australian cattle.

Treatment
The only effective measure to prevent infection spreading up the tail is removal of the affected section of the tail. This is a veterinary procedure where the tail is surgically amputated at least one or two vertebral spaces above the active tail rot infection. It is essential that the tail artery is cauterised to stop the bleeding, and a long-acting broad spectrum antibiotic, such as penicillin, is given to prevent further infection.

SUMMARY OF BEST PRACTICE
- Seek veterinary advice if tail rot is reaching unacceptable levels or amputation is required.
- Control wild dog populations.
Tetanus is an acute disease of mammals characterised by muscular spasms and increased sensitivity to stimuli. Tetanus occurs in humans and has been reported in all domestic animals except the cat. In the Northern Territory, the disease has been reported in horses, cattle, sheep, pigs and dogs. Horses are reportedly the most susceptible. Tetanus can be a common cause of death in weaners after castration, branding and dehorning.

Clinical Signs

- rigid muscles
- sensitive to light, noise and touch
- prolapse of third eyelid
- sawhorse stance
- pricked ears
- raised tailhead
- lockjaw
- bloat
- high temperature.

Diagnosis

- Clinical signs
- History of:
  - previous tetanus on property
  - no vaccination
  - poor hygiene with surgical procedures (castration, dehorning)
  - recent wound.

Prevention and Control

- vaccination
- wet down dusty yards
- disinfect castration and dehorning instruments
- apply antiseptic to wound
- remove animals from yards immediately after dehorning and castration.

Vaccination

The tetanus vaccine is usually incorporated with other clostridial vaccines into a single vaccine such as ‘5in1’ or with the Leptospirosis vaccine ‘7in1’. It is also available as a ‘5in1’ vaccine with a Vitamin B12 supplement. Vaccination against tetanus is not generally practiced but should be considered in cases where there is a clear history of the disease on the property or in the yards. If vaccinating, the recommended procedure is to vaccinate the weaners and follow up with a booster within four to six weeks. Often the booster is given at the following muster.
SUMMARY OF BEST PRACTICE

- Aim to reduce contamination of surgical instruments by placing them in antiseptic while not in use.
- Adopt best practice for branding, castration and dehorning as per MLA manual.
- Prevent wounds from becoming infected by application of an antiseptic to the wound.
- Wet the yards down and move weaners out of the yards as soon as possible.
- Weaners and calves should be castrated and dehorned just before leaving the yards and not before trucking.
- Consider vaccinating weaners with a ‘5in1’ or ‘7in1’ vaccine, followed by a booster four to six weeks later or at the next muster especially on properties with a history of tetanus.

Source

Further information
The CattleSite: Tetanus in Cattle.
http://www.thecattlesite.com/diseaseinfo/239/tetanus-in-cattle
MLA Book.

Related topics
Horse Health, Vaccination, Castration, Clostridial Diseases, Dehorning.
Three-Day Sickness
Susanne Fitzpatrick, DoR Darwin

Three-day sickness or Bovine Ephemeral Fever is a viral disease of cattle and buffalo. It is an endemic disease spread by mosquitoes and biting midges affecting cattle across the Top End for several months of the year. Seasonal variation influences the distribution of the disease with movement further south when flooding occurs in the Tennant creek and Alice Springs regions. The clinical signs usually occur for a period of about three days.

Because natural infection provides a lifelong immunity, young stock are most commonly affected. The disease occurs much more sporadically in the southern, cooler regions. If a region has been through several dry wet seasons and has not experienced any clinical cases, then the problem can become quite severe after a big wet. A much higher proportion of older animals will become infected. Valuable stud animals from the south will be susceptible because they have no natural immunity. The disease can be more severe in heavier animals.

Clinical Signs
- Fever and depression as evidenced by drooped ears
- lameness, muscular stiffness, shivering, twitching
- recumbency (downer)
- reduced water and food intake
- abortion
- drooling saliva, watering eyes and runny nose
- heavier and older animals more severely affected as extended periods of recumbency cause muscle damage.

Diagnosis
Contact your Regional Livestock Biosecurity Officer to report illness or stock deaths.

They will conduct a disease investigation, collecting a history, examining cattle and collecting samples from livestock of during post-mortem. Diagnosis is usually made from observation of clinical signs in the herd from September to July, but particularly in the wet season. Laboratory diagnosis is made by testing blood or tissue for the presence of the virus or antibodies to the virus.

Prevention and Control

Vaccination
Live and inactivated vaccines against three-day sickness are available from vets. Both require an initial dose and a booster four weeks later. The live vaccine provides protection for up to one year, and the inactivated for up to six months. An annual booster should be given each year, prior to the Wet. Vaccination is unlikely to be necessary in the Top End for all except imported stock such as older animals and stud bulls from southern regions.

Treatment
- It is best to leave the animal alone if too far from the yards.
- Provide shade, food and water (do not force to eat or drink).
- Move cattle from side to side to prevent muscle damage. A soft sandy area is most suitable.
- Valuable animals should be treated with anti-inflammatory drugs. Antibiotics as secondary pneumonia may become a complication.
Implications for the cattle industry in the NT

- During an outbreak, mustering has to be postponed because the stress it causes may increase mortality. Animals that go down may die of thirst in hot weather or suffer a loss in condition when feed is in short supply. Milk flow is diminished in lactating cows.
- Bulls may become temporarily infertile.
- Cows may abort in late stages of pregnancy.
- Stock moving from the Alice Springs region to the northern part of the NT during an epidemic run a high risk of becoming infected and developing clinical symptoms.
- After natural exposure to the disease, a long-lasting immunity is attained. Death occurs in only 1% of cases.

SUMMARY OF BEST PRACTICE

- Vaccinate all valuable animals that have been brought in from southern regions.
- Avoid mustering infected cattle.
- Ensure shade, food and water is provided to sick animals.
- Call your local Senior Field Veterinary Officer or Regional Livestock Biosecurity Officer to confirm diagnosis.

Source

Further information

Related topic
Vaccination.
Ticks

Grant Parker, formerly DPIFM Katherine and Sharon Kearney, DoR Darwin

The cattle tick (*Rhipicephalus microplus*) is the most dangerous external parasite of cattle in northern Australia. The cattle tick is capable of causing a reduction in productivity due to blood loss and ‘tick worry’ or by transmitting tick fever. If left uncontrolled cattle tick can cause serious losses to the cattle industry. Ticks were identified as one of the most common animal health problems in the Top End Region (Pastoral Industry Survey, 2004) with 88% of properties using chemical products to control them.

**Effects**

- Infested cattle lose condition due to ‘tick worry’ and loss of blood.
- Cattle ticks transmit the organisms that cause tick fever. This can be fatal to susceptible animals; others may suffer severe loss of condition.
- Previously unexposed cattle can become heavily infested until they build up resistance.
- *Bos indicus* (Brahman type) cattle and their crosses develop greater resistance than *Bos taurus* (British type) cattle.
- Lactating cows or animals in poor condition are especially vulnerable.
- Heavy infestations can kill calves and even adult cattle.

**Control**

- Use resistant *Bos indicus* cattle – in the Northern Territory, cattle tick control is usually through the use of resistant cattle. Treatment is confined to cattle being exported to or through tick-free areas.
- Use pasture spelling as a management tool together with strategic dipping. Tick larvae can survive up to six months in warm climates. It is difficult to incorporate this into practical pasture rotations. With a pasture which has received a lengthy spell e.g. wet season, all cattle going into the paddock should be treated – especially if they are not 100% Brahman genotypes.
- Tick control can be achieved by using pour-on or injectable products or plunge dips. Plunge dipping is efficient and effective and for cattle tick control. Plunge dips are located on a number of properties in the Top End Region, including most Cattle Export Depots. Various chemical products are available. In the Darwin region Amitraz is recommended for use in plunge dips due to the development of chemical resistance to some synthetic pyrethroids and organophosphates. Amitraz is an effective knock down tickacide, but has no residual effect. It is suitable for treating cattle bound for meat works but offers no protection against buffalo fly (if a dual purpose is required).
• The injectable and pour-on macrocyclic lactones and insect growth regulators (flurazuron) offer a residual effect and will give protection for 4–6 weeks. Because flurazuron is secreted through the milk, calves suckling cows do not have to be treated. These compounds are ideal to use where strategic spelling is implemented into the program but they are much more expensive per head than the spray and dip chemicals. There is a 42 day withholding period for flurazuron. These products would be most suitable to use on terminal sire which may have a lesser content of Brahman and are therefore more prone to tick infestations. They are also ideal for portable yards and where handling facilities and infrastructure are limited.

• Tick resistance in cattle is a heritable trait, and progress can be achieved by selecting animals with known resistance. The possibility of achieving this may become easier in the future due to ongoing research on gene markers for resistance. Nevertheless, if breeding bulls tick burdens are one of the traits that should be recorded and included in the selection index if ticks are an issue in the region.

• Parkhurst strain ticks resistant to synthetic pyrethroids and organophosphates are present on a number of Top End Region properties. Properties classed as infected for Parkhurst resistant ticks have specific movement conditions to follow when moving livestock off their property. These strict movement conditions are in place to prevent the spread of Parkhurst resistant ticks further in the NT.

**SUMMARY OF BEST PRACTICE**

• Use tick resistant cattle and select for resistance in replacement animals.

• Strategic treatment with chemical products (acaricide) and ensure careful attention is paid to using the correct dose rates and maintenance of dips. Under strength preparations can lead to chemical resistance.

• Only import tick free cattle onto properties.

• Treat terminal sires with an appropriate pour on preparation that has a long residual action.

• Monitor resistance problems and frequently alternate chemicals used to minimise the risk of resistance.

• Spell paddocks to break the lifecycle.

**Sources**


**Further information**


**Related topics**

Cattle dips, Tick Fever.
Tick Fever

Susanne Fitzpatrick, DoR Darwin

‘Tick fever’ is caused by microscopic parasites transmitted to cattle by cattle ticks. These parasites invade and destroy red blood cells causing a severe and sometimes fatal disease.

Key Factors Influencing the Tick Fever Risk

Population of ticks on the property
- Properties in the marginal zone are most at risk.
- All stock introduced from tick free areas.
- Good seasons increase tick numbers.
- Neighbours may stock with infested or highly susceptible cattle.

There are two types of tick fever found in cattle in the Northern Territory:
- Bovine babesiosis (commonly known as tick fever or redwater) caused by Babesia bovis and Babesia bigemina parasites.
- Anaplasmosis, caused by the Anaplasma marginale parasite.

Tick survival on the pasture
- Larval stage ticks can survive on the pasture for two to six months.

Tick survival on cattle
- In some tick-infected areas there is resistance to commercial tick treatments.
- Bos indicus cattle carry fewer ticks than British and European cattle.
- Male cattle carry more ticks than female cattle.

Numbers of infected ticks
- Not every tick carries tick fever; even ‘ticky’ cattle may not have been exposed to the parasites and may not be immune to tick fever.

Cattle’s natural resistance to tick fever
- British and European cattle are more susceptible to tick fever than Brahman breeds.
- Older cattle with no previous exposure are more susceptible to tick fever than calves/weaners at three to nine months of age.
- Bulls are more susceptible to tick fever than other classes of cattle.
- Stressed cattle (e.g. poor condition, pregnant) and excessively fat cattle are more prone to tick fever.

Clinical Signs
- fever (one week)
- yellow sclera (whites) of eyes and mucous membrane (jaundice)
- anaemia
- reduced appetite
- stands with head down
- rapid breathing and heart rate
- red urine (Babesia).

Diagnosis
- Clinical signs
- Babesia
  - blood smear from tail tip
- Anaplasma
  - blood smear from jugular vein
  - Infected red blood cells.

The death rate of fully susceptible animals (European cattle from tick-free areas) is at least 20%. The death rate in susceptible Brahman cattle is thought to be less than 1%.
Prevention and Control

Vaccination (blooding)

Tick-fever vaccination (blooding) is recommended for cattle moving from tick-free areas into tick-infected areas. Cattle should be vaccinated at least two months before they leave the tick-free property to ensure lifelong immunity. If this is not practical, cattle may be vaccinated after they arrive and have recovered from the stress of the trip. They should be treated with a long-acting acaricide (pour-on) on arrival and be monitored for four weeks after vaccination in case they experience a reaction to the vaccine. The current live vaccines are much safer than the older ones.

Vaccine reactions may cause fever or ill thrift. The risk of vaccine reactions increases with age and bulls and pregnant cows should be observed following vaccination.

Export cattle from tick-free areas can be blooded prior to shipping depending on the requirements of their destination. Export cattle must be free of cattle tick prior to loading.

Tick Control

Organophosphate, synthetic pyrethroid and amidine products should be used to prevent cattle tick during the vaccination process, but must be applied every three weeks to be guaranteed. Theoretically, Macro cyclic lactones and tick development inhibitors are not suitable because they don’t affect the early (larval) stage of the tick.

According to the Darwin Pastoral Industry Survey 2004, 12% of producers in the Top End Region vaccinate for tick fever.

Treatment

Babesiosis

- Imidocarb (Imizol® or Imidox®) (1 mL/100 kg subcutaneous injection)
- Non-steroidal anti-inflammatory drugs.

Anaplasmosis

- Imidocarb (Imizol® or Imidox®) (2.5 mL/100 kg subcutaneous injection)
- Long acting Oxytetracycline antibiotic.

If treating an animal that has experienced a vaccine reaction, ensure that the recommended dose is used (as per the label). Higher doses will sterilise the animal.

Tick fever vaccine can be ordered directly from the Tick Fever Centre or through your local produce merchandise store. It is a live vaccine and has a limited shelf life. It is usually only dispatched in the first three days of the week to avoid freight delays over the weekend. ALWAYS contact the centre prior to ordering vaccine so that suitable freight arrangements can be made.

SUMMARY OF BEST PRACTICE

- Vaccinate cattle moving from tick-free areas into tick-infested areas at least four weeks prior to travelling.
- Properties in the marginal tick zone are most at risk and need to implement a vaccination program according to the length of time since ticks were last present and the likelihood of reinfection after the impact of the wet season has been assessed.
- Most tick fever outbreaks occur during the wet season when producers cannot easily get to the cattle. Mustering and stressing stock in the face of an outbreak can be disastrous. Weigh up the benefits of blanket injection as a part of normal husbandry.
- Control ticks.

Sources


Further information

Tick Fever Centre Ph (07) 3898 9655.

MLA Producer Hotline Ph 1800 155 900.


Related topics

Ticks, Vaccination.
Urea Poisoning

Susanne Fitzpatrick, DoR Darwin

Urea poisoning is one of the more commonly suspected toxicities of cattle in the Northern Territory. Urea is used as a source of non-protein nitrogen (NPN) in feed supplements. In ruminants, nitrogen from urea is released into the rumen (as ammonia) and can be used by the rumen microflora to synthesise protein. This protein then becomes available to the animal by the normal processes of digestion and absorption. If more urea is eaten than the rumen organisms can metabolise, the ammonia is absorbed from the rumen and enters the blood. The ammonia is then converted back to urea in the liver, and is excreted by the kidneys. This pathway can easily be overwhelmed, and 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, particularly if the supplement is wet.

Causes of poisoning

- excess consumption of urea
- sudden introduction in high quantities of urea
- irregular consumption
- wet mineral supplement.

Clinical Signs

- bloating
- twitching of ears and face
- grinding teeth
- abdominal pain
- drooling frothy saliva
- rapid breathing
- frequent urination
- staggering
- bellowing
- recumbent (downer).

Diagnosis

Contact your Regional Livestock Biosecurity Officers to report the illness or stock deaths.

They will complete a disease investigation collecting the history, and samples for post-mortem. A history of access to urea and post-mortem showing bloat, white foam in airways, ammonia odour when rumen is opened or an alkaline rumen pH >7.5-8 is highly suggestive of toxicity. Laboratory diagnosis requires the collection of blood and rumen fluid immediately after death and a sample of rumen and reticulum in formalin.

Prevention/Control

- Introduce urea into diet gradually.
- Avoid supplement getting wet. Urea is hygroscopic, so absorbs water and becomes liquid even in a mixture.
- Avoid letting pools of water develop on top of the supplement (this can even happen with large blocks).
- Thorough mixing of loose mix.

Treatment

- Relieve bloat by passing a stomach tube and drenching with approximately 45 litres of water and 6 litres of vinegar.
- May need to repeat drench within an hour.
- Treatment is not usually effective.
SUMMARY OF BEST PRACTICE

- If cattle have not been previously supplemented, start with salt and gradually introduce the supplement.
- Once supplementation is started, ensure cattle get consistent regular access. If supply is interrupted for several days, recommence animals at a lower level.
- Feed loose-mix supplement or blocks under a shelter to prevent urea getting wet.
- Suspect urea poisoning if cattle are found dead close to the supplement.

Source

Related topics
Supplementation.
Vaccination

Susanne Fitzpatrick, DoR Darwin

Vaccinations are available for several diseases affecting the productivity of Top End herds. Adherence to manufacturers’ instructions, best practice hygiene principles and correct technique are crucial to a successful vaccination program.

Types of Vaccines

There are three different types of vaccines:

- Live vaccines provide lasting immunity, usually with one dose.
- Inactivated or killed vaccines require a booster to provide lasting immunity.
- Anti-toxins and anti-serums provide immediate short-term immunity.

Immunity

Immunity in an animal is achieved through the body’s response to a foreign protein (vaccine). The immune system produces antibodies to the vaccine antigen. Adjuvants (materials that enhance the action of a drug or antigen) are added to vaccines to increase the immune response to the antigen. The antigen is slowly released from the injection site. Two commonly used adjuvants are aluminium hydroxide which remains at the injection site for a few weeks, and an oil-based adjuvant which holds the vaccine at the site for a longer period.

Passive immunity is acquired as a foetus/calf by the transfer of maternal antibodies from the vaccinated mother through colostrum and the placenta. Active immunity is acquired following natural infection or vaccination. Vaccinations can involve a single shot, or a course of two shots four to six weeks apart. The first dose provides protection against diseases for a few weeks. The booster provides protection for a few months. Most vaccines take between 10 and 14 days to provide protection. Annual boosters are usually required to maintain immunity. Stress (both management and nutritional) affect the development of immunity in an animal. Always aim to have stock in reasonable condition when vaccinated.

Equipment

Steel vaccination guns and all needles must be sterilised by boiling in water before and after use. The gun can be lubricated with a vegetable or castor oil (not paraffin) to prevent rubber seals from perishing, but this must be rinsed out with boiling water before use. To sterilise plastic guns, soak in 500 mL water plus 20 mL household bleach (4% w/v available chlorine) for one hour. Rinse with cool, boiled water before use. Avoid the use of strong disinfectants for sterilising. Vaccination gun needles should be 16 or 18 gauge and 12.5–15 mm long. This length makes it unlikely to reach the muscle.
**Technique**

The vaccine should be delivered into the subcutaneous space under the skin (not into the dermis or the muscle). Pinch a section of loose skin and inject between the skin and the muscle into the subcutaneous space. The bevel of the needle should be parallel with the skin and the needle angled at 45 degrees (see diagram). Please note that some vaccines are injected into muscle.

Two problems commonly occur when vaccinating:

1) Temporary or permanent enlargement of the localised lymph node or abscess formation at the injection site. This is usually a result of a contaminated needle or injection into the muscle. Injection into the muscle commonly occurs when the needle is angled at greater than 45 degrees.

2) Resistance to injection. This occurs when the needle is inserted into the dermis of the skin (rather than the subcutaneous space), and can happen when the bevel of the needle has been orientated away from the skin.

**Correct injection technique (Fordyce QDPI&F, 2002)**

**SUMMARY OF BEST PRACTICE**

- Record details of all vaccines used – batch number, expiry date and details of animals treated.
- Always read the manufacturer’s instructions for each vaccine, recommended vaccination program, dose rate, vaccination technique and site, storage and expiry date.
- Store vaccines in the refrigerator at 4 °C (unless specified otherwise), and in eskyes with bottles of iced water in shade at the yards. Vaccines are sensitive to heat and light. If vaccines are frozen or left in hot sun the protein is denatured. Using ineffective vaccines is a waste of time and money and does not provide protection.
- Vaccines should be placed in a cooler bag when being used.
- Do not save unused opened vaccines for future use, as they are usually contaminated.
- Discard vaccines not used within 24 hours of opening.
- To prevent needle reactions, inject between the skin and the muscle into the subcutaneous space. The bevel of the needle should be parallel with the skin and the needle angled at 45 degrees.

**Source**

**Further information**

**Related topics**
Botulism, Leptospirosis, Tetanus, Three Day Sickness, Tick Fever, Clostridial Diseases, Vibriosis.
Vibriosis

Vibriosis is a venereal disease of cattle transmitted at mating, including artificial insemination. Vibriosis is caused by the bacterium *Campylobacter fetus*. The bacterium is a particularly persistent organism that inhabits the reproductive tract of cows. In bulls it may be present indefinitely in the prepuce, penis and in semen unless treated. It will not survive outside the animal. Cows infected at mating are likely to abort.

**Distribution**

Vibriosis has been found in every region of the Northern Territory.

**Mode of Infection and Spread**

Vibriosis is spread through herds by sexual activity. Sexually mature and active animals are susceptible to infection, unless already immune. The most common source of infection in a herd is through the introduction of infected animals. Once introduced into a herd, it can be spread to susceptible animals at mating.

When a cow is infected, the organism passes through the cervix and establishes itself in the uterus. This leads to inflammation of the lining of the uterus and oviducts. It is not until this inflammation subsides that further successful conceptions can occur, by which time the organism has been expelled from the reproductive organs. It is possible, however, that the organism may persist for some months in the vagina.

**Signs and Symptoms**

There are no obvious symptoms in bulls. If a cow is infected with vibriosis at mating, she is likely to show signs of delayed conception or failure to conceive due to the early death of the embryo. The infection that occurs due to the presence of the bacteria prevents fertilisation from recurring. Most females recover from vibriosis, but about 11% of infected females become permanently infertile due to obstruction of the oviducts and can be seen in herds as fat, barren cows. Vibriosis often results in lower conception rates in herds in which it is endemic. Maiden heifers are usually most severely affected as they do not have immunity from previous exposure to the disease. The most common indicator of vibrio in heifers is a delayed pattern of conception where heifers are infected, abort and then take some time to recover before conceiving again. Animals that have overcome infection usually develop a sound immunity.

Although difficult to detect in the paddock, the most common signs of vibriosis are delayed conception and occasionally aborted foetuses between three and seven months of age. Weak or premature calves may be seen in herds that are affected by vibriosis.

**Diagnosis**

Vibriosis can be confirmed by laboratory testing of vaginal mucus, preferably mucous discharge from the cervix when a cow is in heat, and by testing preputial washings from bulls. Samples are placed in special media for transport. *Campylobacter fetus* may also be identified in a stained smear or by culture. None of these diagnostic methods are 100% reliable. Consequently, in most situations in northern Australia, the disease is assumed to be present and control measures initiated.
Control

Extensive properties in northern Australia often choose to tolerate the effects of vibriosis in their herds rather than attempting to control the disease. Control through vaccination is possible on smaller properties. The cheapest way to control the disease is through vaccination of bulls as they are responsible for spreading it through the herd. This is only successful where there is good bull control and there are no incursions from outside bulls.

The most effective way to control vibriosis is through a planned vaccination program. It is possible to treat animals with antibiotics but this is not considered economical or practical. Cows may develop immunity themselves after three to six months, and herd tolerance may occur naturally after two to three years, however, there is the possibility that some cows will remain carriers. Using virgin vaccinated bulls on heifers will be beneficial.

Vaccination

There are four common approaches to a vaccination programs:

1) no vaccination
2) vaccinate all bulls
3) vaccinate all bulls and heifers
4) vaccinate all bulls, heifers and cows.

Opinions amongst cattlemen vary with regards to which is the best program to implement.

In the past, the preferred program has been to vaccinate the bulls only. Many producers still choose to do this.

With the increasing value of cattle, and the knowledge that vaccination programs have shown increased pregnancy rates in heifers, producers should now consider vaccinating heifers and bulls.

At present, few producers, except studs, vaccinate all breeding animals.

A bivalent vaccine is recommended for use in vaccination programs and all animals should be vaccinated at least four weeks prior to joining. Vaccination programs must be ongoing to be effective because animals will lose their immunity. Bull control is also critical to the success of the vaccination program.

Bulls

Initially require two 5 mL doses, four to six weeks apart, and annual 5 mL boosters. New bulls to the property should also receive the two 5 mL doses. Two vaccinations will clear the disease from infected bulls.

Cows and heifers > 18 months

One 5 mL dose before joining will provide protection, followed by an annual 2 mL booster prior to joining.

Cows and heifers < 18 months

Initially require two 5 mL doses, four to six weeks apart and then an annual 2 mL booster prior to joining.

Note of Warning

In vibriosis-free herds, introduction of the disease through infected bulls can result in large declines in calving rates. Care should be taken to prevent infected or unvaccinated bulls entering the herd. Vaccination of all animals could be considered if good bull control is not possible.

SUMMARY OF BEST PRACTICE

- Use a bivalent vaccine in the vaccination program.
- All new bulls introduced to the property should be vaccinated twice, six weeks apart.
- The vaccination program will only be successful if total bull control is achieved.

Source


Further information

Taylor, L (2005). Cattle Disease- Campylobacteriosis or Vibriosis, Queensland DPI&F Note.

Related topics

Heifer Management, Vaccination.
Worms

Susanne Fitzpatrick, DoR Darwin

Cattle disease associated with internal parasites (worms) is uncommon in the Top End region. Seasonally dry pastures and rangelands and extensive grazing patterns on larger properties prevent transmission opportunity for the free-living larval stage, except during the wet season when transmission is usually associated with areas of intense grazing. Worms can be a problem for livestock on small holdings where the pasture is not spelled and for weaners on swampy floodplains.

Common worm species identified in the Top End Region

The small intestinal worm (*Cooperia* spp.), nodule worm (*Oesophagostomum radiatum*), and barber’s pole worm (*Haemonchus placei*) are the common cattle worms in the Top End Region.

Worm burdens can be present (helminthiasis) without causing disease (helminthiosis). The main symptoms of parasitic disease include ill thrift, anaemia and/or scours. Calves are exposed to infective larvae from the day they start grazing. Cattle develop a strong acquired immunity by 18–24 months of age. Nutrition, especially protein, affects the rate of immunity development. Immunity in adult cattle can be compromised in periods of illness, malnutrition and after calving.

Parasitic disease is usually only seen in weaners, and is commonly associated with periods of stress, exposure to high larval numbers in permanent weaner paddocks, high stocking rates or poor nutrition. Faecal Egg Counts (FECs) are a useful indicator of adult worm burdens in young susceptible cattle. A minimum of 10 individual fresh faecal samples are required for testing.

Small intestinal worm (*Cooperia* spp.)

Present in the small intestine. Adult worms penetrate the lining of the small intestine. Clinical signs include weight loss and anaemia.

Nodule worm (*Oesophagostomum radiatum*)

Present in the large intestine. Following ingestion, larvae penetrate the wall of the intestine and form nodules before migrating to the colon where they form adult worms. The nodules can impair intestinal function, especially fluid resorption which results in dark, foul-smelling diarrhoea. Disease may occur following weaning.

Barber’s Pole Worm (*Haemonchus placei*)

Present in the abomasums (stomach). The larvae puncture small blood vessels in the stomach wall and suck blood. Clinical signs include weakness, weight loss and anaemia. Severe cases show pale conjunctiva and mucosa, and swelling under the jaw and stomach. Severe infestations can be easily seen in the stomach.

Faecal egg counts (weaners)

<table>
<thead>
<tr>
<th>Worm species</th>
<th>Eggs per gram faeces</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Significant</td>
</tr>
<tr>
<td><em>Cooperia</em></td>
<td>500</td>
</tr>
<tr>
<td><em>Oesophagostomum</em></td>
<td>200</td>
</tr>
<tr>
<td><em>Haemonchus</em></td>
<td>200</td>
</tr>
</tbody>
</table>
Treatment

Effective management of parasite problems includes treatment of the animal and reduced pasture contamination. Anthelmintic treatments (chemical substances used to destroy internal parasites) are available in injectable, oral and pour-on formulations. Please note the withholding period and export slaughter interval and manufacturer directions before use.

Other internal parasite species

Liver fluke (*Fasciola hepatica*)

Liver fluke is not known to occur in the NT. The intermediate host, *Lymnaea tomentose* (a snail), is not known to be present in this environment. Livestock travelling to Western Australia originating from a liver fluke infested area must be tested and treated for liver fluke before they cross the border.

Hydatids (*Echinococcus granulosus*)

Hydatid disease is not known to occur in the NT. Cattle imported from other states may present with old degenerate calcified lesions visible on post-mortem.

SUMMARY OF BEST PRACTICE

- Parasitic disease is usually only seen in weaners, and is commonly associated with periods of stress, exposure to high larval numbers in permanent weaner paddocks, high stocking rates or poor nutrition.
- Clinical signs can include weight loss, anaemia and weakness. If worms are suspected, submit dung to the laboratory for faecal egg counts.
- Consider anthelmintic treatment of worms at times of maximum stress (weaning, second calf heifers). Under NT conditions worm treatment is not normally practiced and the financial viability of drenching is not proven.
- Strategic drenching programs and pasture spelling need to be considered in intensive grazing systems on improved and irrigated pastures.

Further information


Stefani, JA (1994). *The use of Ivomec® in the Gulf District of the Northern Territory*, TechNote 85, DPIFM.

Related topics

Coccidiosis, Weaning.
Zoonoses

Jessica Mayes, formerly DPIFM Katherine

Diseases which can spread from animals to humans are known as zoonoses.

Zoonotic diseases can be spread by livestock, household pets, feral animals, wildlife and rodents or by coming in contact with soil or water contaminated by animals.

The main zoonoses of concern to participants in the cattle industry in the Top End of the Northern Territory are:

- Australian bat lyssavirus
- Hendra virus from bats and horses
- Q fever from cattle and goats
- Ross River fever from horses and native fauna via mosquitoes
- Barmah Forest fever from horses and native fauna via mosquitoes
- Murray Valley Encephalitis from mosquitoes
- Leptospirosis from cattle, rats, dogs and pigs via urine and water
- Melioidosis from the soil
- Helminth infections from dogs and cats

Practising good hygiene, wearing protective clothing, maintaining healthy animals and undertaking vaccination where appropriate, can minimise the risk of infection.

Pregnant women and staff with immuno-suppressive disorders are most at risk.

SUMMARY OF BEST PRACTICE

The risk of infection by many zoonoses can be reduced through taking simple hygienic precautions, such as:

- Do a risk assessment of the region and identify the prevalence of zoonoses.
- Vaccinate staff in high risk areas.
- Avoid contact with urine and faeces of animals.
- Wash hands well after handling animals or birds and before touching food.
- Do not put unwashed fingers in your mouth.
- Always wear shoes and avoid walking through wet, boggy areas with bare feet.
- Worm pets regularly and seek veterinary assistance if your pet is unwell or you notice skin disease, diarrhoea or other disease.
- Wear gloves when handling animal faeces, game meat and gardening.
- Cook all meat well, especially game meat, such as wild pigs.

Sources


Centre for Disease Control (CDC), Department of Health.
http://www.health.nt.gov.au/Centre_for_Disease_Control/

Further information


DPI&F http://www.nt.gov.au/d/Primary_Industry/

Related topics

Dog Health, Leptospirosis.
# Chapter Seven: Other

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Buffalo
Barry Lemcke, DoR Darwin

Buffalo are an alternative animal which can be run on properties in the Top End. Buffalo are well adapted to the Top End, particularly the coastal floodplains. Crossbreeding programs have provided excellent market potential for high quality healthy meat, a range of dairy products and for live export to SE Asia. The management of buffalo is similar to cattle with the added advantage that they can maintain productivity on lower quality roughages. A well managed buffalo herd has few disease problems and is capable of a high turnoff rates. The marketing of farmed buffalo products however requires further development to maximise the market potential.

Origins
There are 3 broad categories of domesticated buffalo in Australia:

- Swamp; the tractor of South East Asia;
  - These were introduced from Indonesia as provisions for the three early British settlements in the Top End from 1822–1849, all of which were abandoned (including the buffalo). This created the nucleus of the NT feral buffalo population.

- Riverine; the dairy type from India/Pakistan;
  - Some early imports into Port Darwin from India in 1886 were used around the original settlement pulling carts and probably providing some meat/milk. New introductions from the US in 1994–1997 were the basis of the current NT herd, which is gradually building up in numbers from the original imported heifers, their progeny and by backcrossing from swamp cows for 5 generations.

- Mediterranean; dual purpose meat/dairy animal from eastern Mediterranean, (from Italy to Egypt). These genetics have been introduced into Australia via semen from Italy in the last 10 years for proven milking ability.

Adaptation
Buffalo were very well adapted to the Top End and in particular the sub-coastal floodplain country and built up a huge feral population reaching 360,000 head by the 1980s. They thrived and were better suited than the British breeds of cattle that were originally brought in. Buffalo are now found in all states of Australia.

Differences to Cattle
Research comparing swamp buffalo and Brahman cross cattle showed that buffalo are better able to utilise poor quality roughages, such as NT dry season native grasses with low protein and energy, because they chew (ruminate) feed into a finer particle size in digesta, and are more efficient at nitrogen recycling from the kidneys. Buffalo cows lactate more efficiently in the dry season with less detriment to the breeder’s body condition compared with cattle. Both species can be run together in the same paddock. Buffalo appear to have a wider range of plant selectivity than cattle. Buffalo have a longer gestation period of 310 days in Riverine and 325–330 days in Swamp compared with 283 days for cattle. They also have a lower dressing percentage because of the heavier hide weight and horns. The meat is leaner than beef with 48% of the cholesterol content of beef.
**Products/Markets**

1) **Live Export slaughter to SE Asia.**
   Regular shipments of feral and farmed buffalo are exported to Indonesia and Malaysia.

2) **Meat / TenderBuff for the local market in Australia.**
   This is only possible where there are local abattoirs (eg recent closure of the abattoir near Darwin has halted TenderBuff meat supply). TenderBuff is a QA compliant specified product from young animals to ensure a top quality eating experience. There are 5 specifications to comply with at slaughter before the carcass can receive the identifiable stamp of the TenderBuff brand. Buffalo is also suitable for processing meat because of its low fat content compared with beef. Crossbred river/swamp buffalo will outgrow swamp buffalo by 40%, so are better suited for TenderBuff production in a farmed situation.

3) **Dairy products including cheese / yoghurt.**
   Dairy production from buffalo is possible providing suitable pastures are available year-round or there are good sources of concentrates feeds that are relatively cheap. These enterprises could also be viable in areas that are marginal for dairy cattle, particularly in the low wet and wet / dry tropics. Buffalo milk has twice the solids of cow's milk, so a unique range of cheeses is possible, the most famous of which is mozzarella. Buffalo dairy products are also suitable for people with cow's milk allergies.

4) **Live Export breeders of both Swamp and Riverine**
   Riverine and crosses for meat and dairy production generate better returns than Swamp breeders. The Top End is well placed for supplying neighbouring countries to the north of Australia with high quality animals.

**Husbandry**

Most operations are similar to that used for cattle. They herd similarly but have higher shade requirements because of fewer sweat glands than *Bos indicus* cattle. Because of their lower tolerance of overheating than cattle, mustering and yarding operations need to avoided when high temperatures are prevalent.

**Musterung**

Buffalo can be mustered on horseback, with bikes or vehicles similarly to cattle and they respond well if not stressed and operations are done at a walking pace. Low Stress Stockhandling courses provide the foundations for correct mustering training and other operations. The objectives are for animals to walk and walk straight. This is determined by distance and position of the mustering crew. Buffalo work well when trained to follow a lead rider, but bulls can sometimes create mustering problems by constantly heading off the lead cows, so may need to be mustered separately.

**Dehorning**

As with cattle, buffalo calves have 3–4 mm of hair around the horn which should be removed before 2–3 months (earlier is best) of age using a scoop dehorner or they can be disbudded within 4 weeks of birth using a hot iron. In general the whole herd needs to be dehorned, or not at all, as dehorned animals in a horned mob will usually be victimised by the others. Dehorning gives handlers greater confidence working with buffalo. The horns may be useful if left intact where dingoes are common. Dehorning would be of benefit in a dairy situation.

Horn tipping is required for export shipment of slaughter buffalo and they are removed to about the level of the ear tips. Younger stock need less horn removed.

**Castration**

The same procedures as for cattle are used for buffalo. In general the testes are smaller and are easily withdrawn into the abdominal cavity when the bull is small. Castration is best done with the animal standing up using either a sharp knife, scalpel, or elastrator® rings. The preference is not to perform castration in wet weather/muddy conditions to avoid the risk of infection.
Vaccination

In the Top End there is no evidence that vaccination of buffalo is vital under good husbandry and feed conditions. For export breeder animals or interstate movements, 7in1 or 5in1 vaccinations are recommended to cover the main bacterial diseases. Botulism vaccinations would be advisable in endemic areas, and Vibriosis vaccinations also if it is known to be endemic.

Controlled mating

For ease of management and maximum calf growth it is recommended that mating to have calves born at the beginning of the wet season will result in the best outcomes for calving intervals and fertility of the herd. This eliminates the need for multiple weaning, and allows better co-ordination of herd management for marketing operations. In the Top End, bulls are joined with breeders at a rate of 1 bull to 30–40 cows and for about 3–4 months between December and April depending on pasture condition.

Segregation

Weaners and market animals should be run separately from the breeder herd on better quality pasture. This eliminates yard injury to young calves in the breeder herd and optimises nutrient availability for the weaners and market animals. It is preferable that market animals are monitored regularly through the yards when closer to turnover to minimise stress when ready to send.

Weaning

Apart from its beneficial effects on the dam, weaning has very important implications for handling of the buffalo during its whole lifetime because training at this stage, away from the influence of the dam, facilitates handling for the rest of its productive life. For example, production in a feedlot later in life will be superior to a non-weaned animal. Weaning is an important factor in reducing overall stress and teaching the animal to cope with stress when it is applied. Training the animal to handle the yards is best done at this early stage.

To ensure that animals do not suffer any setbacks, a suitable weaning weight is 200 kg live weight especially if saved pasture, floodplain or early wet season new pasture is available. For a swamp buffalo herd with controlled mating weaning in the September to October period is suitable whereas crossbred riverine buffalo can be weaned sooner because of their superior growth rates.

Handling

Low stress operational techniques are highly recommended for buffalo handling. Buffalo can be highly strung or dangerous if badly handled, but become extremely placid animals when they become familiar; trusting and friendly with the owner/handlers in intensive handling situations such as a dairy or a feedlot.

Bulls

Generally multiple bulls in mating groups are not possible in small paddock situations or in adjacent paddocks, due to fighting. In some instances, bulls that have been reared together and never separated may be compatible especially before fully grown.

External Parasites

The two most common and damaging parasites are buffalo fly and buffalo lice.

Buffalo fly are not as severe as with cattle and can be controlled with insecticidal eartags, sprays, pour-ons or heavy-duty back-rubbers. The walk-through buffalo fly brush trap is a non-chemical approach and easy to construct.

Buffalo lice generally only exacerbate the situation if the animals have poor nutrition. Young calves in poor condition can lose significant weight if lice numbers are high. The lice can be controlled with pour-on insecticides at 14–16 day intervals. The use of Broad spectrum pour-ons is much more costly than specific lice preparations. If all animals on the property are treated twice in the same schedule, there is a good likelihood of achieving total eradication provided that there are sufficient quarantine measures in place from animals brought in from other properties or from feral incursions.

Internal Parasites

Generally they are not an issue requiring treatment under normal grazing conditions in the Top End as the long dry season serves as a good buffer against worm survival. There has been only one wet season where elevated worm counts were recorded in many calves. When weaners are kept in yards over a long period and fed on the ground they would be best treated at the start of confinement. Many oral and pour-on preparations are available for treating worms; often they control all parasites, internal and external, with the one preparation. Adults rarely require treatment, except as part of export market requirements.
Current situation

The Northern Territory is the largest supplier of live cattle and buffalo to South-East Asia. Most of the cattle are Brahmans and are well adapted to local conditions. About 40% of the turn-off of Territory cattle is destined for the live export market and 37% of Australian live cattle exports are shipped through the Port of Darwin. Indonesia has the greatest market share, followed by the Philippines, Brunei and Malaysia (refer Figure 1).

The main cattle classes exported are feeder steers/spayed heifers (±350 kg liveweight (LW)) for offshore feedlot operations, slaughter stock (>400 kg LW), pregnancy tested in-calf (PTIC) breeders and bulls. Other livestock exported through the Port of Darwin include goats, camels and horses.

The livestock ships that operate in South-East Asia generally carry 800–2500 head of cattle and take three to five days to reach destination ports. Their operations are governed by strict marine orders. Larger ships carrying more than 10,000 head deliver to several destinations in one trip.

The industry is supported by the Northern Territory Livestock Exporters Association (NTLEA) which was established in 1980 and represents about 20 industry members who are exporters. The Livestock Export Accreditation Program (LEAP) is a quality assurance program that ensures exporters comply with animal welfare standards.

Figure 1  Northern Territory live cattle exports
A history

The first shipments of cattle from Darwin were sent to Hong Kong in 1885. Thereafter, 2000 head of cattle a year were shipped to Jakarta and Singapore using a specially commissioned steamer, ‘The Darwin’, which was capable of carrying 250 live cattle. In the 1920s cattle were exported to Manila but the trade fizzled out during the Great Depression of the 1930s. With the emergence of road transport to southern states in the 1950s and the establishment of meat works to supply US and Japanese markets in the 1960s, shipments of cattle only continued intermittently and on a small scale.

The 1970s oil crisis brought an end to the boom in the meat trade. Live exports to South-East Asia re-emerged as a market, albeit on a relatively small scale. It was not until the early 1990s that the trade really started to grow and become a significant alternative market for NT cattle, reaching almost 500,000 head a year. The South-East Asian economic crisis of 1997 resulted in a sharp decline in the trade.

Today, the NT exports more than 250,000 live cattle a year, a trade valued at about $205 million or 1.7 per cent of Gross State Product (GSP). The industry’s value is probably twice this figure if agistment and transport of Queensland cattle shipped through the Port of Darwin and other services associated with the industry are taken into account. The NT live cattle export trade today is a highly professional industry that leads Australia in terms of standards.

Importing and exporting procedures

1) South-East Asian importers place orders with one or more licensed exporters and receive a quote that includes purchase cost, insurance, and freight (CIF) to port of disembarkation, or landed price. The order specifies the type of cattle and other livestock required and the time of shipment. The importer then arranges an Irrevocable Documentary Letter of Credit from his bank and an Import Permit to be sent (by fax) to the nominated exporter prior to shipment.

2) The exporter submits a Notice of Intention (NOI) and Consignment Risk Management Plan (CRMP) to the Australian Quarantine and Inspection Service (AQIS) for approval to proceed with the order. The exporter then sources and selects the stock for export, sometimes with the help of the importer’s ‘selector’. The selected cattle are transported to an export quarantine facility where they are introduced to ship rations and prepared for export according to the requirements of the Australian Standard for Export of Livestock (ASEL). This includes treatments to comply with the health protocols of the importing country which are undertaken by an AQIS-accredited veterinarian. There are different protocols for different classes of livestock such as breeders, feeder and slaughter animals. A Northern Territory Government delegate (Senior Field Veterinary Officer or Regional Livestock Biosecurity Officer) must certify that the property of origin is free from notifiable diseases prior to shipment. The vendor must declare that the property of origin is free from endemic diseases required by the importing country. A Northern Territory Government delegate (Senior Field Veterinary Officer or Regional Livestock Biosecurity Officer) must certify that the property of origin is free from notifiable diseases prior to shipment. A Vendor Declaration is required for endemic diseases.

3) AQIS then assesses the documentation and inspects the consignment before granting ‘Permission to Leave for Loading’ on to the ship. During transport to the ship, the truckloads of cattle pass over a weighbridge to obtain the total weight of the consignment, and after the consignment is loaded onto the vessel, the exporter applies to AQIS for an Export Permit and Health Certificates.

4) Loading is governed by strict regulations defining the amount of space required per animal class of a given weight.
Discharge

When the shipment arrives at the destination port, the cattle are off-loaded and the consignment re-weighed (optional) en route to the quarantine holding area near the port or at the feedlot. The cattle are usually held in quarantine for 14 to 28 days according to the laws of the importing country.

Cattle usually maintain or increase bodyweight during the voyage to destinations within South-East Asia and mortalities are negligible (less than 0.5%).

National animal welfare standards

There are five animal welfare standards to be met in the live export of cattle, as listed below. For details on the requirements for each standard visit the DAFF website (see Further information).

Standard 1 – Sourcing and on-farm preparation of livestock
Standard 2 – Land transport of livestock
Standard 3 – Management of livestock in registered premises
Standard 4 – Vessel preparation and loading
Standard 5 – Onboard management of livestock

Future

The live export trade is likely to continue to increase as the demand for beef increases in South-East Asia. It is quite likely that the Northern Territory pastoral industry will not have the capacity to meet future demand. However, this prospect is overshadowed by animal welfare groups who are determined to try to shut down the industry even though pastoralists and exporters already comply with some of the strictest animal welfare regulations in the world.

Source
Northern Territory Livestock Exporters Association Inc. www.ntlea.com.au

Further information


Related topic
Selling Options.
Macropods

Helen Neave, Parks and Wildlife Service of the Northern Territory, DNRETAS, Alice Springs

Of the 50 species of macropod found in Australia, 10 species exist in the wild in the Northern Territory, and six occur in the Top End region (refer Table 1).

There have been no attempts to systematically survey the distribution and abundance of macropod species across the Top End of the Northern Territory.

Concerns have been raised over agile wallaby numbers which are the dominant macropod species found in the Top End region. Permits have periodically been granted to landholders for the non-commercial destruction (shoot-and-let-lie) of agile wallabies in the Top End.

At present, there is no commercial harvest of kangaroos or wallabies permitted in the Northern Territory.

Table 1: Macropod species of the Top End region, Northern Territory, and their conservation status in Australia

<table>
<thead>
<tr>
<th>Species</th>
<th>Conservation status Australia</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Macropus agilis</em> – Agile wallaby</td>
<td>Abundant</td>
</tr>
<tr>
<td><em>Macropus antilopinus</em> – Antilopine wallaroo</td>
<td>Sparse</td>
</tr>
<tr>
<td><em>Macropus robustus</em> – Euro</td>
<td>Common</td>
</tr>
<tr>
<td><em>Onychogalea unguifera</em> – Northern nailtail wallaby</td>
<td>Common</td>
</tr>
<tr>
<td><em>Petrogale brachyotis</em> – Short-eared rock-wallaby</td>
<td>Common, limited</td>
</tr>
<tr>
<td><em>Petrogale concinna</em> – Nabarlek</td>
<td>Rare, limited</td>
</tr>
</tbody>
</table>

The Agile wallaby in the Top End Region

The Agile wallaby is perceived by many landholders in the Top End region to be a significant pest, particularly in riparian areas, including along rivers and around floodplains. Agile wallabies occur in high densities along some stretches of the Daly, Adelaide, Finniss, Mary and Reynolds Rivers and their tributaries. They particularly favour improved pastures close to riparian areas.

Under the *Territory Parks and Wildlife Conservation Act 2006* (TPWC Act), macropods are classified as protected wildlife throughout the Northern Territory. The TPWC Act prohibits the taking, interference with, possession, control or movement of protected wildlife unless authority to do so is granted. Provisions for the killing of protected wildlife are provided for in the Act. Authorisation to take or interfere with protected wildlife is by permit issued by the Director of Parks and Wildlife. The Director may apply terms, conditions or limitations to the permit to regulate the non-commercial destruction of kangaroos or wallabies.
Non-commercial destruction

Determining wallaby densities and level of impact

Requests for the non-commercial destruction of wallabies for damage mitigation purposes are assessed on a case by case basis to determine whether there is a wallaby problem that warrants management action. In most cases, the preferred management action is destruction rather than translocation, based on animal welfare concerns (stress and risk of injury to animals) and the logistics of translocation.

Applications for the non-commercial destruction of wallabies are independently assessed by authorised PWCNT officers. The assessment process may involve:

- the consideration of property size and characteristics
- number of previous permits issued and compliance with the conditions of these permits
- nature of wallaby populations on the property and neighbouring properties including estimated population densities
- recent climatic conditions.

Permits

A person wishing to kill a species of protected wildlife cannot do so unless he or she has been granted a permit to do so, or is a nominee under a permit granted to another person to do so. The permit process in the Northern Territory as it relates to the non-commercial destruction of kangaroos and wallabies is summarised in Figure 1.

Permit to Take Protected Wildlife

A Permit to Take Protected Wildlife may be issued for the removal of problem animals e.g. non-commercial destruction of wallabies. Written permission of the landholder or relevant lands authority must be obtained prior to applying for a permit.

The landholder must provide the reason destruction is warranted, by listing the unwanted impact/s of wallabies on their property.

A permit for non-commercial destruction (shoot-and-let-lie) of wallabies is subject to conditions. The permit applicant or nominated kangaroo shooter must:

- hold a current Firearms Licence
- have successfully completed approved firearms accuracy accreditation
- shoot wallabies in accordance with the Code of Practice for the Humane Shooting of Kangaroos and Wallabies for non-commercial Purposes (DEWHA, 2008b)
- carry their permit with them at all times while operating in the field and provide the permit to any authorised officer on request
- provide returns to the PWCNT in the prescribed format within 21 days of expiry of the permit.

A permit may be revoked if PWCNT gain information indicating that conservation management measures may be required to protect a wallaby population.

Figure 1. Permit procedure in the Northern Territory for the non-commercial destruction of kangaroos and wallabies

Landholder applies to PWCNT for a permit authorising the person of person's nominee to take protected wildlife under Division 6, Section 55 of the TPWC Act. Landholder nominates licenced shooter to take kangaroos / wallabies.

PWCNT officers assess permit application and perceived kangaroo / wallaby problem.

- Permit issued by an authorised PWCNT officer.
- Licensed shooter shoots kangaroos / wallabies in accordance with the Code of Practice for the Humane Shooting of Kangaroos and Wallabies for Non-commercial Purposes.
- Kangaroo shooter must hold a current Firearms Licence pursuant to the Firearms Act 1997, and only use prescribed firearms and firearm / ammunition combinations set out in Schedule 1 of the Code of Practice for the Humane Shooting of Kangaroos and Wallabies.
- Returns to PWCNT within 21 days of expiry of the permit.
National Codes of Practice for the Humane Shooting of Kangaroos and Wallabies

At present, shooting is the most economical, humane and cost-effective way to cull kangaroos and wallabies. The current nationally-endorsed Codes of Practice for the Humane Shooting of Kangaroos and Wallabies outline an achievable standard of humane conduct and is the minimum required of persons shooting kangaroos and wallabies (DEWHA, 2008 a & b).

SUMMARY OF BEST PRACTICE

• Know your macropods.
• Apply for a Permit to Take Protected Wildlife.
• Adhere to the National Code of Practice for the Humane Shooting of Kangaroos and Wallabies for Non-commercial Purposes.

Sources


Further information

Regional Parks and Wildlife Office
Darwin Ph: (08) 8999 4555.

Related topic

Large Feral Animals.
Large Feral Animals

Anne Walters, Wildlife Management, Parks and Wildlife, DNRETAS Darwin

Large feral vertebrates are widespread throughout much of the Northern Territory. Of particular concern are buffalo and wild pigs in the Top End region.

Feral animals pose a serious environmental and agricultural threat and have been associated with:

- declines in the abundance, extent and diversity of native plant communities due to trampling and ingestion of seedlings
- increased soil erosion and sedimentation of natural waterways and water bodies as a result of trampling and reduced vegetative cover
- competition with native vertebrate species for feed and habitat
- consumption of seedlings and plant materials, reducing the capacity of the ecosystem to regenerate
- increased spread and establishment of weeds
- decreased abundance and diversity of aquatic and terrestrial invertebrates
- decreased pastoral productivity due to competition for feed and degradation
- damage to fences and floodgates.

Control

Aerial platform shooting of large vertebrates from a helicopter has proven to be the most ethical, environmental, economical, and labour-efficient method of removing feral animals. Aerial shooting is target-specific so there is little or no effect on non-target species or the environment. The shooting technique used by the Northern Territory Government is endorsed by the Australian Government Department of Environment and Heritage as the most humane method for reducing the numbers of feral animals. This technique involves shooting the animals using the ‘double tap’ method, which requires that two shots be fired at the heart and lungs in rapid succession. This results in a quick death, with minimal stress and suffering.

Parks and Wildlife sometimes use radio telemetry to rapidly locate animals during shooting operations. This procedure involves capturing an individual and fitting a collar installed with a radio transmitter. The animal is subsequently released to join another herd. Approximately one month later, a shooter will track the animal and shoot all the animals in the herd except for the collared ‘Judas’ animal. This procedure can be repeated in the following months as the collared animal relocates to a new herd.
Method

Parks and Wildlife can provide trained aerial platform shooters to undertake large scale shooting operations. Ammunition and helicopter costs must be paid by the requesting landholder. Landholders are encouraged to contact their nearest Parks and Wildlife office to provide details of the extent of the required operation and to organise a shooting operation on their property. Where possible, landholders should provide Parks and Wildlife with several weeks notice prior to shooting. A mutually convenient time for shooting will then be arranged. Landholders are strongly encouraged to synchronise shooting with neighbouring landholders in order to increase the effectiveness of the operation.

Landholders should keep records of the date and location of the shoot and the numbers of feral animals that were removed during the shooting operation.

Where to shoot

To reduce the time and costs associated with this type of operation, landholders should provide details of those areas requiring the most intensive shooting operations.

When to shoot

Shooting operations are most effective in the dry season, when many of the smaller water bodies have dried up, causing feral animals to concentrate in areas with permanent water.

Warning

Aerial platform shooting can be dangerous. Landholders should inform neighbouring landholders of expected flight paths and areas where the operation will be carried out. In areas with an Indigenous community landholders should inform the community of the operation.

SUMMARY OF BEST PRACTICE

- Control of feral animals will reduce their effect on the environment and increase pastoral productivity.
- Aerial control by shooting is the most appropriate method of control on a large scale.
- Aerial shooting can be carried out by trained Parks and Wildlife personnel.
- Efficiencies will be greatest if areas to be shot are prioritised and if shoots are scheduled for the late dry season when feral animals are concentrated on permanent waters.

Sources and further information

Department of Land Resource Management
In the Top End region, most cattle are sold out of the paddock into the live export trade. Other selling options, depending on location, prices and seasons, may include forward contracts, over-the-hooks sales to an abattoir and online or saleyard auctions.

**Selling Options**

*Harmony James, formerly DRDPIFR Tennant Creek*

**Paddock sales**

Stock are inspected on the vendor’s property by the buyer and are sold straight out of the paddock, with the price generally negotiated on a cents per kilogram basis with or without an agent. This is the most common method of sale to the live export industry in the Top End region.

**Advantages**

- minimal selling costs and minimal transport and handling
- buyers know in advance the number and class of stock to be delivered
- weighing point, delivery point and curfew negotiable
- most agents in the NT sell del credere (payment guaranteed).

**Disadvantages**

- limited competition and carcass feedback
- potential for rejection at point of delivery for out-of-specification animals if paddock inspection is not thorough.

**Forward contracts**

A standard forward contract is a contractual agreement between the producer and a buyer to supply a given product at a given time for a given price. The contract includes the details:

- number of cattle to be delivered
- specifications of the contract cattle
- pregnancy status of female cattle accompanied by a certification from an accredited pregnancy tester
- date of delivery
- pricing arrangements.

**Advantages**

- provides a guaranteed price, eliminating the risk of price fluctuations
- enables producers to confidently plan cattle supply program and husbandry requirements
- allows implementation of appropriate feeding and grazing management strategies
- a guaranteed return can assist with negotiating loans and managing finances
- buyers can guarantee continuity of supply and maintain the reputation and integrity of their product brands
- buyers can clearly communicate their precise requirements to both producers and agents.

**Disadvantages**

- requires a high degree of control over the production system to supply the specified product at the specified time
- may have to forego opportunities to sell at higher prices
- may have to source cattle from elsewhere if there is a shortfall in the required number of cattle specified in the contract.
Over-the-hooks

The lack of a local abattoir, transport costs and a competitive live export market tend to deter producers in the Top End region from selling to an abattoir. There is optimism that an abattoir will be established in the Top End in the next few years.

Over-the-hook sales, based on predetermined weight and grade prices, will incur lower selling costs and allow the seller to establish the total sale price before cattle leave the lot. Stock may be sold with or without an agent and are delivered directly to the abattoir. Change of ownership takes place at the abattoir scales with the terms of sale varying between abattoirs. Generally the producer pays for transport to the abattoir and the transaction levy. The producer is not paid for condemned carcasses or bruise trim.

Actual carcase weight measured at the abattoir can vary depending on the carcase trim used, and whether a hot or cold weight is used. The carcase is weighed at the end of the chain while it is still ‘hot’. If the abattoir trades on cold weight, 3% is deducted from the hot carcase weight to provide the cold weight. The actual deduction for shrinkage varies from 2–4% to account for the water weight loss during cooling.

All AUSMEAT accredited abattoirs are required to pay on hot weight and AUSMEAT standard carcase trim and must also provide carcase feedback. For abattoirs that are not AUSMEAT accredited, the vendor should check the conditions under which they will be trading. Stock is sold on an agreed ¢/kg carcase weight or via a price grid where premiums and discounts are calculated for different carcase attributes.

Advantages
- subjective appearance (e.g. coat colour) values do not affect the price received
- producers receive clear market and price signals relating to carcase quality and are provided with feedback
- minimal transport and handling
- female carcases of the same quality as male carcases can achieve the same price/kg.

Disadvantages
- availability and seasonality of abattoirs.

Saleyard auction

Presently, the live export market out-competes the auction system for store cattle in the Top End region. In auctions, cattle are sold on a cents per kg (¢/kg) liveweight basis, or on $/head for store sales. Occasionally, bulls or a conglomeration of small lots of cattle are sold through saleyard auctions.

Advantages
- wide competition and accessibility
- all stock types and lots of any size can be sold
- vendors can set a reserve price and can compare quality and price
- payment is guaranteed by the agents.

Disadvantages
- transport costs, saleyard dues and weighing fees must be paid
- possibility of buyer collusion and no negotiation between buyers and vendors
- limited feedback for the vendor, no carcase feedback
- meat quality can be reduced by stress caused by transport and handling.

AuctionsPlus (formerly CALM)

AuctionsPlus, formerly CALM (Computer Aided Livestock Marketing), is an electronic method of sale by description. AuctionsPlus combines the best features of the saleyard system while allowing direct consignment to the buyer. The sale is on-property, with animal details entered into a computer. The animals are assessed prior to the sale by an accredited AuctionsPlus assessor who describes the cattle to the buyers. Cattle can be sold on the basis of $/head, ¢/kg liveweight or ¢/kg carcase weight or on a grid. Sales are weekly and bids can be taken by telephone or computer nationally. Transport costs are paid by the buyer and transit insurance is provided by AuctionsPlus.

Advantages
- suits geographically isolated producers
- large range of buying and selling options
- producers can set a reserve price with nationwide competition
- no transport costs for producers
- payment is guaranteed
- feedback is provided to producers for ¢/kg and grid sales
- minimal transport and handling damage.

Disadvantages
- buyers have to adjust to using a computer and not viewing live animals
- vendors and buyers need to have confidence in the CALM assessors.

Sources
VDPI (1996), Marketing Options for Beef Cattle, Agriculture Notes AG0575, Victorian Department of Primary Industries.
AuctionsPlus.

Related topics
Live Cattle Export Industry.
Wild Dog Control

ESC Smith, Chemical Services Section, DPI&F and Anne Walters, Wildlife Operations, Parks and Wildlife Commission of the NT

In the Northern Territory, the term ‘wild dog’ is used to collectively describe dingoes, feral domestic dogs and their hybrids. Wild dogs are known predators of livestock and can cause significant economic losses to pastoral production by maiming and killing cattle and through reduced production due to stress. While calves and weaners are most vulnerable to wild dog attack, wild dogs can also cause damage to adult animals making stock unfit for the export market and downgrading the animal’s value. Protective behaviour by cows can sometimes be enough to deter attacks on calves although much depends on the health, condition and protectiveness of the cows.

Wild dogs can also transmit parasites to livestock.

Control

Dingoes are a native species and are protected under the Territory Parks and Wildlife Act (2000), thus making it an offence to possess, interfere with or kill dingoes without authorisation.

While poisoning is the main method of control on pastoral properties, alternative methods such as shooting, trapping or exclusion fencing can also be considered. Sodium fluoroacetate (1080) is the only poison registered in the NT for the control of wild dogs. Baiting with 1080 is a safe and efficient method of controlling wild dogs as they are very susceptible to the chemical with only 0.3 mg per kg body weight needed to kill a dog, and it is reasonably “target specific”.

A landholder (the term includes owner, occupier or property manager) who wishes to conduct a 1080 wild dog baiting program on their property must obtain the authorisation 1080 Pest Animal Management Authorisation (1080 PAMA and Permit) which includes a Permit to Take Protected Wildlife (issued by DPI&F).

Landholders are strongly encouraged to synchronise baiting with neighbouring properties to increase the effectiveness of the operations. This is possible by the formation of, and membership in, a Regional Wild Dog Management Group (RWDMG). Where there is a minimum of two adjoining or nearby properties, family or company owned management groups with various properties, or an amalgamation of a larger number of properties that combine into a group covering a distinct region of the NT, and all agree to coordinate their baiting programmes, they may apply to DPI&F to form a RWDMG with a Baiting Plan and as a part of this Group, prepare their own injected baits.

Method

Under the current permit system, landholders have several options to manage wild dogs with 1080 baiting. They can:

• elect to continue to lay freshly cured wet meat baits injected with 1080 by Parks and Wildlife Commission (PWCNT) personnel;
• engage a suitably qualified licenced contractor to prepare wet meat baits;
• purchase and lay commercially manufactured dry baits; or
• undertake the relevant training course to achieve competency to inject freshly cured wet meat baits and subsequently have them distributed on their property if they are members of a RWDMG. Other station personnel can also be trained as bait injectors to prepare freshly cured wet meat baits on their properties but only if part of a RWDMG.

In all cases, suitably authorised persons holding a 1080 User Authorisation issued by DPI&F must collect and distribute the baits on the property under direction from the landholder who holds the 1080 PAMA and Permit.
1. The PWC baiting service

The fresh meat baiting service will continue to be offered by PWCNT staff for a fee. To request baiting, landholders must contact their nearest PWCNT office and provide details of the number and type of baits that they have been authorised to lay on their property and the likely timing of the baiting operations. Where possible, pastoralists should provide PWCNT with several weeks’ notice prior to baiting. A mutually convenient time for baiting will then be arranged.

Landholders must supply the bait meat (horse, donkey, camel or beef) and bins for the poisoned bait. Baits should be of beer-can size (400–500 g), preferably prepared the day before and cured overnight on mesh racks. Curing allows a dry skin to form around the bait and prevent leakage of the 1080 solution. An authorised PWCNT officer will inject baits with a diluted 1080 solution, which delivers 6 mg of 1080 per bait. People handling and distributing the poisoned, freshly cured wet meat baits must wear impervious gloves (e.g. nitrile) and protective clothing to avoid skin contact.

2. Contractor providing the baiting service

Currently, there are no contractors licenced to inject wet meat baits. However, it is likely that one or more will be licenced during 2013 and that the procedure to engage such a contractor will be similar to the PWCNT requirements. Once licenced by the Department of Health, the contractor’s details will be listed on the Chemical Services Section website at www.chemicalservices.nt.gov.au

3. Purchasing commercially manufactured dry baits

There are three commercial bait products containing 1080 which are registered in the NT for wild dog control. The landholder should indicate on the 1080 PAMA and Permit application to DPI&F that he wishes to purchase and use dry manufactured baits on his property. The authorisation will indicate the number of dry baits permitted.

4. Suitably trained staff preparing injected baits

The landholder or other station personnel can attend a training course and subsequently be authorised to inject freshly cured wet meat baits on their properties if they are members of a RWDMG with a Baiting Plan. Permits will not be issued to a single property to inject their own baits. As a member of this Group, authorised bait injectors can prepare freshly cured wet meat baits by injecting 1080 concentrate for use on properties within that RWDMG. All properties involved in the Group must have a current 1080 PAMA and Permit. Further details are available on the DPI&F website www.chemicalservices.nt.gov.au

When to bait

In the Top End Region, wild dog damage is greatest during calving or when calves have just been weaned. Baits should be put out in the late afternoon to minimise consumption by birds such as crows and hawks. Authorisation is generally for two major baiting events a year and these should coincide with the four times of the year when dingoes are most vulnerable:

- April to May (mating)
- July to August (whelping)
- October to November (pups moving about for first time)
- January to February (pups receiving hunting training).

Where there is a lower proportion of pure dingo genes in the pest animals, the above times become less distinct. Baiting should be undertaken in the dry season when properties are more accessible and baits are less affected by both heat and rainfall.

In the southern half of the NT, fluctuations in wild dog populations are more dependent on climatic conditions and the baiting should attempt to cover times when stock are most at risk.
Chapter Seven: Other

SUMMARY OF BEST PRACTICE

• Contact Chemical Services Section at DPI&F to discuss wild dog problems and 1080 baiting

• Apply for and receive a Pest Animal Management Authorisation (PAMA) which includes a Permit to Take Protected Wildlife (a 1080 PAMA and Permit).

• If required, contact a PWCNT office or a licenced Pest Control Operator with 1080 baiting requests and supply details from the approved 1080 PAMA and Permit.

• If working within a coordinated RWDMG, complete and submit a Proposal Form for a Regional Wild Dog Management Group Baiting Plan.

• Receive the Authorisation to purchase and possess 1080 concentrate on behalf of a Regional Wild Dog Management Group (RWDMG) as attached to the approval of the RWDMG.

• Read and adhere to all conditions on the registered product label, the Directions for use of 1080 for Pest Animal Control, and those that may be imposed by the Chemicals Coordinator on the 1080 PAMA and Permit and other authorisations.

• Synchronise baiting programs with neighbours.

• Time the baiting programs to maximise effectiveness.

• Notify all residents, occupiers and neighbours of land to be baited.

• Display baiting signs.

• Handle baits and 1080 concentrate appropriately, and

• Adhere to the restrictions where baits can be laid.

Sources

Directions for use of 1080 for Pest Animal Control
www.chemicalservices.nt.gov.au


Guidelines to develop a proposal to form a Regional Wild Dog Management Group
www.chemicalservices.nt.gov.au

Parks and Wildlife Service, Department of Natural Resources, Environment and the Arts.


Further information

DPI&F Chemical Services Section, Darwin
Ph: (08) 8999 2344, www.chemicalservices.nt.gov.au

Parks and Wildlife Commission of the NT, Darwin
Ph: (08) 8995 5008
http://www.parksandwildlife.nt.gov.au

Warning

It is the responsibility of landholders to communicate their intention to bait to all persons who might be affected. This includes every resident and/or occupier of the area to be baited and all neighbours within a 3 km radius of baiting. Three days notice must be given either verbally or in writing. If verbally, a written note of the date, time and discussion should be made. The notification records must be kept for a period of at least two years. At the time of baiting, the landholder must display secure signs on all public roads entering and through the baited area. These signs should be maintained for a minimum of 28 days after baiting.

The signs must state:

• WARNING
• 1080 POISON BAITS LAID HERE
• DOMESTIC DOGS, PETS OR ANIMALS MAY BE AFFECTED IF THEY EAT BAITS OR DEAD ANIMALS
• PROTECT BY RESTRAINING OR MUZZLING
• BAITS LAID FOR WILD DOGS
• BAITS LAID ON (Date)
• CONTACT TEL No. 08………

Baits must not be laid within:

• the municipal boundaries of a town
• 3 km of a community or outstation
• 1 km of any other dwelling
• 20 m of a permanent watercourse
• 5 m of a boundary fence
• 250 m of the edge of a formed public roadway
• 500 m of main roads and highways.

Distance restrictions apply also for roadside reserves, designated roadside rest stops, truck parking bays, fuel stops, tourist areas and other public amenity areas. Other conditions may also be imposed by the DPI&F Chemicals Coordinator when the 1080 PAMA and Permit is authorised.

Further details are provided in the DPI&F publication Directions for use of 1080 for Pest Animal Control (www.chemicalservices.nt.gov.au) and the Directions for Use on the 1080 product labels.
Working Dogs

Trudi Oxley, DoR Katherine and Neil McDonald, Sherwood Kelpies, South Australia

Using working dogs to aid in handling cattle can significantly reduce labour costs and mustering times. The following points need to be considered to get the maximum benefit from using dogs for cattle work.

Use dogs that have a natural instinct to cover, hold and block
This comes from genetics. Suitable breeds are generally collie and kelpie type dogs. These dogs are naturally forceful and have mob respect. They know when to apply pressure and when to give relief.

Tie or cage dogs at all times.
Unless you are training them, working them or giving them a supervised fun run.

Develop a good rapport with the dog.
Do this through voice and body language, in recreational situations as well as work.

Have enough dogs
Have enough to cover all points of the mob and to create force or flow without the use of heel bite. Heel bite can create panic and can trigger individual cattle attempting to escape from a mob. You need to have multiple dogs working together independently around a mob, in much the same way as you would place staff. Instead of using extremely aggressive dogs to create flow you may need to have a bigger number of herding type dogs.

Seek information
Ask about working herding type dogs and attend a school to receive practical training in how to work with these dogs. Learn how to prevent situations occurring such as the dog blocking the gate.

Take the concepts you and your dogs have learnt
Use concepts from a school and begin to develop a trainer mob. You must have a trainer mob to create a learner person or learner dog friendly environment. The trainer mob must be easily accessible to facilitate training sessions whenever required. They will need to broken in to withstand much more pressure than just normally ‘quiet’ cattle.

Use correct hand signals
Never point to where you want a dog to go, always point in the opposite direction to where you want them to go or block them with body language.

Learn to read and lead livestock
Don’t sabotage the efforts of the dog in bringing them to you.
Don’t over-face your dogs
Avoid mobs of grown cattle with no dog respect. Over time, through building on the trainer mob and educating weaners, you will eventually have the whole herd accepting dogs. You may decide that some older breeders are not worth the extra work of dog-training and avoid using dogs on those mobs until older breeders go out of the herd and are replaced with younger dog broken heifers. Having your whole herd gradually broken in as weaners will avoid the need for more drastic measures on older animals such as the use of ‘hanging’ type dogs which will defeat the purpose of calm quiet stock movement.

Get the trainer cattle mob right
Let their attitude of cooperation become infectious through the mob. This trainer mob can then be used as a coacher mob for any recently weaned or purchased cattle when tailing out, as well as to make the training process much easier. Mix the recently weaned or purchased cattle into the trainer mob of cattle; maybe five or 10 at a time.

There is a big difference between quiet cattle and properly dog-educated ‘trainer’ cattle
Quiet cattle may be able to withstand the pressure placed on them by inexperienced dogs. It is important to give young dogs the chance to have a ‘win’ with these educated trainer cattle as you train them.

Initially, the dogs need to learn to bring cattle to you
Develop the dogs’ holding ability and to educate cattle to want to stay in a mob. This does not mean you will always have to work your stock in this fashion, but it’s extremely important for the tuition of the dog, the cattle and the handler. As the dogs become more experienced you can then teach them to work in a ‘droving’ or pushing situation with you at the back or side of the mob.

Can dogs stand up to the Top End region conditions?
Using dogs under the temperature and humidity conditions presented by the Top End Region climate and conditions adds to the challenge of using working dogs; however there are many producers in northern Australia who successfully use dogs.

SUMMARY OF BEST PRACTICE
• Have a cattle herd which have been properly dog broken (preferably as weaners) and will quietly come together and stay as a mob.
• Use dogs with enough instinct and training to hold and travel with the cattle - escorting them, rather than ‘chasing’ them and wasting energy.
• Have enough dogs to be able to rotate them to allow some to rest and get a drink and still have enough be able to keep working the mob.
• Have utes or trailers set up with shade and water to rest dogs.

Further information

Information on Working Dog and Stockhandling Schools is available from DPI&F Katherine, Ph: (08) 8973 9739.

Related topics
Dog Health, Stock Handling.
Chapter Eight: Floodplains Production

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Introduction

There are a range of types of floodplains in the Top End Region of the Northern Territory which flood to different depths for different durations each year.

The littoral floodplains are coastal and contain salt and mud flats which are liable to saline flooding. They have no grazing potential.

The Sub-coastal floodplains are on the lower reaches of the main rivers of the region. They are flooded deeply for several months each wet season. The soils are predominantly deep, black cracking fertile clay soils. In their natural state, the low lying areas of these sub-coastal floodplains which are flooded the deepest during the wet season are the most productive. The main grasses found in these deeply flooded areas are native hymenachne (Hymenachne acutigluma), spiny mud grass (Pseudoraphis spinescens), swamp rice-grass (Leersia hexandra) and wild rice (Oryza sp).

On the middle and upper reaches of the rivers are the solodic floodplains which are liable to shallow flooding each wet season for periods of up to four months. The soils are infertile, often mottled yellow duplex soils including solodics, soloths and solodised-solonetz. In their natural state, these areas provide limited dry season grazing, mainly from perennial grasses such as kangaroo grass (Themeda triandra) and plume sorghum (Sarga plumosum).

The floodplains alternate with hills and undulating country. The upland soils in the areas adjacent to the floodplains are inherently infertile and are of low carrying capacity and productivity. Most floodplain properties have a protein drought and lower animal productivity in the wet season, which is the reverse of the dry season protein drought experienced on properties on upland areas.

The main enterprise on most floodplain properties is the grazing of cattle during the dry season. Other enterprises include grazing of buffalo, fishing safaris, hunting safaris (buffalo, pigs) and collecting royalties from the harvest of crocodile eggs.
Traditionally, land condition is measured by three criteria:

- **Soil condition**: the capacity of soil to absorb and store rainfall, to store and recycle nutrients, to provide habitat for seed germination and plant growth, and to resist erosion.
- **Pasture condition**: the capacity of the pasture to capture solar energy and convert it to palatable green leaf, to use rainfall efficiently, to conserve soil condition and to cycle nutrients.
- **Woodland condition**: the capacity of the woodland to grow pasture, to cycle nutrients and to regulate groundwater.

In the floodplain situation, the capacities should refer to water use, as the origin of some of the water on the floodplain may be up to hundreds of kilometres away.

Pasture condition assessment is based on the presence of perennial, productive and palatable grasses (3P) still applies. Assessment of annuals is less useful as these can fluctuate quite dramatically from year to year, depending on the height and duration of flooding.

**Grazing history and land condition**

The floodplains of the Northern Territory, particularly those to the East of Darwin, were subjected to uncontrolled grazing by buffalo mainly, but also cattle and horses, for over 100 years up until the mid 1980s.

The effect on the vegetation in general and particularly on preferred grazing plants was severe. For example, in the 1970s, the best areas of native hymenachne were outside those areas with historically high buffalo populations. The opinion at the time was that overgrazing in the late wet to early dry season period was the major long term cause of the deterioration of native hymenachne stands.

With the control of the wild buffalo population, the dominant native perennial grass species have now returned to the floodplains.

**Current Situation**

The majority of the floodplain areas in the Top End region are now in good condition. Domestic stock are now excluded from the floodplains during the wet season by fencing, which spells the flooded pastures and allows them to regenerate each year. Most properties have internal fencing which allows the duration of grazing of different areas of the floodplains to be controlled.

The fencing means that there is control over when cattle are allowed on the floodplains. This prevents the grasses being damaged by pugging or being pulled out of the soft mud.

Some of the shallower floodplains which dry out earlier and have been subject to overgrazing have been invaded by woody weeds such as mimosa (*Mimosa pigra*), sicklepod (*Senna obtusifolia*) and malachra (*Malachra fasciata*). These weeds form a shrubland on some parts of the floodplain.
SUMMARY OF BEST PRACTICE

• Fence to spell the floodplains during the wet season to maintain good condition.
• Control when the cattle can access the floodplain.
• Understand the characteristics of the particular floodplain.

Source
Cameron A G and Lemcke B. (2003). Floodplain Grazing Management Agnote E54 DoR.

Related topic
Land Condition.
The specific native pastures present on a floodplain depend on the type of floodplain and the depth and duration of flooding.

**Sub-coastal floodplains**

The plant species present on the sub-coastal floodplains each have a specific niche, mainly related to flood water depth. There is often a mosaic of species present as water depth changes subtly with micro relief of the floodplain.

There are also large areas where one of the perennial grasses is dominant and almost forms a monoculture.

Useful grasses for animal production on the shallow areas of the floodplains include spiny mud grass (*Pseudoraphis spinescens*), awnless barnyard grass (*Echinochloa colona*), wild rice (annual and perennial, *Oryza australiensis*, *Oryza meridionalis*, *Oryza rufipogon*) and scrobic (*Paspalum scrobiculatum*).

In deeper water, the most useful grasses are swamp rice-grass (*Leersia hexandra*) and Giant Tropical reed (*Phragmites karka*).

In the deepest water, native hymenachne (*Hymenachne acutigluma*) is the best grass.

These grasses are adapted to survive flooding. They survive by keeping some leaf above the water surface during the wet season when flooding occurs. Most of their growth and dry matter production occurs when the flood recedes and the water level drops. Grazing heavily too early in the dry season reduces the productive ability of the grasses and may kill them. Grazing too late in the dry season, prior to early flooding at the beginning of the wet season can have the same effect.

Because they are growing on a fertile substrate these floodplain grasses, particularly the native hymenachne, have high nutrient levels.

**Solodic floodplains**

These floodplains are mostly dominated by unpalatable annual and perennial Eriachne species. The grasses which have the best grazing value are the perennials, kangaroo grass (*Themeda triandra*) and plume sorghum (*Sarga plumosum*).
Floodplain Introduced Pastures

Arthur Cameron and Barry Lemcke, DoR Darwin

A number of introduced grasses and legumes have been successfully grown on floodplains in the Top End region.

While the sub-coastal floodplains are quite productive in their natural state, the solodic floodplains are not. The pasture species which have been sown or planted are all tolerant of waterlogging and flooding.

Sub-coastal floodplains

The introduced grasses which have been successfully planted on the black cracking clays include para grass (Urochloa mutica), Aleman grass (Echinochloa polystachya), Olive hymenachne (Hymenachne amplexicaulis), and Kazungula setaria (Setaria sphacelata). The depth and duration of flooding which the grasses will tolerate ranges from shallow and short for Kazungula through intermediate for para grass, then Aleman grass to deep for Olive. As Olive hymenachne has been declared a Weed of National Significance in Australia, and a Noxious Weed in the Northern Territory, it can not be planted now. It is still present on a number of the floodplains in the Top End.

These grasses have generally been planted to revegetate bare areas or to compete with weeds on the floodplains.

The legumes are generally tolerant of flooding for only about two months. Those which can be sown on the shallow areas of the floodplains are Glenn and Lee joint-vetch (Aeschynomene americana), and Bundey and Cavalcade (Centrosema pascuorum). Phasey bean (Macroptilium lathyroides), which is naturalised on many floodplain areas is beneficial. Milgarra blue pea (Clitoria ternatea) is also an option for shallow flooded areas.

Solodic floodplains

For grasses to be productive on these floodplains, banks need to be constructed to retain water on the floodplains. Fertilisers also need to be applied because of the poor nutritional status of the soils.

Suitable grasses to improve the productivity of these floodplains are para grass, Aleman grass and Kazungula.

The same legumes are adapted to these floodplains, provided the flooding duration is not longer than 2 months.

SUMMARY OF BEST PRACTICE

- Use introduced grasses for revegetation and weed control on the sub-coastal floodplains.
- Use introduced grasses and banks to retain water to improve productivity on solodic floodplains.
- Sow legumes only where duration of flooding is less than two months.

Sources

Cameron, A. G. (2003). Hymenachne, Agnote E33 DoR.
There are two main approaches to estimating carrying capacity:

- Calculate a paddock’s long-term carrying capacity, defined as the average number of animals a paddock can be expected to support over a planning horizon (5–10 years).
- Use a short-term approach, defined as the number of animals a paddock can support for a season or year.

The carrying capacity of a floodplain is dictated by the nature of the floodplain, including depth and duration of flooding, and the grass species which are present on the floodplains.

The carrying capacity of a floodplain is also dictated by the nature of the current wet season, which also influences the depth and duration of flooding. Most properties have some shallow and some deeper flooding areas. This allows them to utilise the shallow areas while the deeper areas are drying out. Where the shallow and deeper areas are in the same paddock, the cattle follow the water out as it recedes.

Each wet season is not identical, but most floodplains grow approximately the same amount of feed each year, so the long term carrying capacity of a paddock can be calculated. The floodplain should be fenced off so the floodplains are spelt each wet season and so that animals do not have access until the pastures are ready for grazing.

When the floodplain can be accessed by cattle for grazing is dictated by the nature of the wet season. If the wet season finishes early, the cattle will be able to graze out onto the floodplain early in the dry season. If there is late heavy rain, the grazing of the floodplain can be delayed for months while the floodwaters drain away. This is sometimes because the cattle cannot cross creeks or deep channels on the floodplain to access the shallow areas.

The sub-coastal floodplains on each of the major rivers are different, and the upper, middle and lower sections of the floodplain are different. Producers have to be familiar with the local floodplain.

In general terms, on average, the Adelaide, Finniss and Reynolds River floodplains are shallower and dry out earlier, while the Daly and Mary River floodplains are deeper and dry out later.

The solodic floodplains, in their natural state dry out early, as the soils have a low water holding capacity.

The times of year when cattle normally go onto the floodplains of some of the Top End rivers are presented in Table 1.
Table 1. Month when cattle commence grazing on the floodplain.

<table>
<thead>
<tr>
<th>River</th>
<th>Expected access</th>
<th>Latest access</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower Adelaide</td>
<td>Week 1 June</td>
<td>Week 1 July</td>
</tr>
<tr>
<td>Middle Adelaide</td>
<td>Week 1 May</td>
<td>Week 1 June</td>
</tr>
<tr>
<td>Lower Daly</td>
<td>Week 2 April</td>
<td>Week 1 June</td>
</tr>
<tr>
<td>Middle Finniss</td>
<td>Week 2 June</td>
<td>Week 1 July</td>
</tr>
<tr>
<td>Lower Finniss</td>
<td>Week 1 June</td>
<td>Week 4 July</td>
</tr>
<tr>
<td>Lower Mary</td>
<td>Week 2 June</td>
<td>Week 1 September</td>
</tr>
<tr>
<td>Middle Mary</td>
<td>Week 1 August</td>
<td>Week 2 August</td>
</tr>
<tr>
<td>Upper Mary</td>
<td>Week 1 April</td>
<td>Week 4 April</td>
</tr>
<tr>
<td>Lower Reynolds</td>
<td>Week 2 April</td>
<td>Week 1 June</td>
</tr>
</tbody>
</table>

When the cattle leave the floodplain depends mainly on the start of the next wet season. It is a balancing act between getting good weight gains from high quality perennial grass regrowth early in the wet season against the possibility of cattle being trapped on the floodplains if the area floods early and the grass being drowned if it is not tall enough to keep some leaf above the surface of the rising floodwater. Mostly, the water rises steadily as the wet season progresses and the cattle work their way off the floodplain ahead of the flood. Another consideration is that if the grasses are grazed down too low and there is an early flood, they can be drowned. The grasses need some leaf above the surface of the water to survive.

On the solodic floodplains, the cattle have to be removed during the dry season because they run out of feed.

The times of the year when cattle are expected to be removed from the floodplains are presented in Table 2.

Table 2. Month when cattle complete grazing on the floodplain.

<table>
<thead>
<tr>
<th>River</th>
<th>Expected departure</th>
<th>Latest departure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower Adelaide</td>
<td>Week 4 November</td>
<td>Week 1 January</td>
</tr>
<tr>
<td>Middle Adelaide</td>
<td>Week 2 December</td>
<td>Week 1 January</td>
</tr>
<tr>
<td>Lower Daly</td>
<td>Week 4 November</td>
<td>Week 4 December</td>
</tr>
<tr>
<td>Lower Finniss</td>
<td>Week 4 December</td>
<td>Week 1 January</td>
</tr>
<tr>
<td>Middle Finniss</td>
<td>Week 2 January</td>
<td></td>
</tr>
<tr>
<td>Lower Mary</td>
<td>Week 4 December</td>
<td>Week 1 Sept</td>
</tr>
<tr>
<td>Middle Mary</td>
<td>Week 2 December</td>
<td>Week 1 January</td>
</tr>
<tr>
<td>Upper Mary</td>
<td>Week 1 September</td>
<td></td>
</tr>
<tr>
<td>Lower Reynolds</td>
<td>Week 4 November</td>
<td>Week 1 January</td>
</tr>
</tbody>
</table>

Stocking rate is critical to the long term sustainability of grazing on the floodplains.

On the sub-coastal floodplains, areas of the preferred perennial grasses can be stocked at approximately 1 animal equivalent per hectare for most of the dry season, of about 6 months. Rain early in the wet season provides high quality regrowth which sustains production. In most areas, the preferred grasses are in a mosaic with other vegetation, which cannot sustain this stocking rate. Current thinking is that a stocking rate of one beast to 1.5–2 hectares will be sustainable in the long term.

On the solodic floodplains, in their natural state, the pastures can only sustain a stocking rate of 1 animal equivalent per 5 to 10 hectares for up to 5 months. With banks to retain water, an introduced grass and fertilisers, these solodic floodplains will carry approximately 1 animal equivalent per hectare for most of the dry season, of about 6 months.

SUMMARY OF BEST PRACTICE

• Learn the flooding characteristics of the floodplain.
• Know when cattle can be expected to enter and leave the floodplain.
• Be prepared to change with the variable wet seasons.

Source

Related topic
Native pasture carrying capacity.
Most producers with floodplains have a set number of cattle in each paddock. Some stock the paddock based on the amount of grass in the paddock each year.

Most producers also engage in some changing of stock numbers (put and take) depending on feed availability.

Early in the dry season, when there is still floodwater in the paddocks, producers will put a limited number of animals in a paddock. More cattle are added as the paddock dries out and more feed is accessible until it is stocked to capacity.

Late in the dry season, if there is no early rain, producers will remove some of the cattle from paddocks to prevent overgrazing of the pasture grasses.

Most producers do not practice rotational grazing, because of the need for more fencing which can be damaged by fast flowing floodwater.

One producer has a cell grazing unit set up for weaners.

**SUMMARY OF BEST PRACTICE**

- Continuously stock floodplain paddocks during the grazing season.
- Adjust stock numbers to available feed.
- Be prepared to change with the variable wet seasons.

**Source**


**Related topic**

Grazing strategies.
Floodplain Weed Management

Arthur Cameron, DoR Darwin and Tony Searle, Manager of Melaleuca Station

Weeds are a constant threat to the productivity of the floodplains.

The main threat to the productivity of the floodplains is mimosa (*Mimosa pigra*) which can form large impenetrable thickets on the floodplains in shallow and deeper water.

Other weeds which can be problems in shallow floodplain areas are sicklepod (*Senna obtusifolia*) and malachra (*Malachra fasciata*).

As with all weeds, prevention is the best cure. Unfortunately, through decades of uncontrolled grazing, these weeds are already present on many floodplains.

Having a strong, vigorous grass cover is the best defence against these weeds. Fencing the floodplains off, spelling during the wet season and grazing only during the dry season allows the grasses to compete with the weeds. This allows the grasses to be competitive with the sicklepod and malachra, but the mimosa when it establishes gets tall and shades out any understorey plants.

An integrated approach is needed to control a mimosa infestation. This involves integrating chemical control, mechanical control, biological control and fire into a co-ordinated program. Because mimosa seed floats, control programs need to be organised on a catchment basis, and need to be co-ordinated with neighbouring properties.

Feral animals, particularly pigs can be a problem, digging up buried seed, spreading seed and providing bare areas for seedlings to establish.

Burning after the first rains of the wet season can control mimosa and other floodplain weeds. Fires can leave bare ground and promote germination, giving weeds an opportunity to re-establish.

### SUMMARY OF BEST PRACTICE
- Prevent weed entry if possible.
- Maintain strong grass cover on the floodplains.
- Use an integrated approach to weed control.
- Consider control of feral animals.
- Prevent wildfires.

### Source

### Related topic
Weed management.
The floodplains of the lower reaches of the Top End rivers are at risk of being flooded by salt water if the sea level rises with climate change. Most of these floodplains are not far above sea level. When the rivers are in full flood, it is often difficult to see where the floodplain finishes and the sea starts.

There have been problems with salt water intrusion on the Mary River over a number of years. Earthworks have been constructed with varying success to counter this salt water intrusion.

**Summary of best practice**

- Expect some climate change.
- Plan for change on the floodplains.

**Related topic**

Climate change.
Cattle grazing on the sub-coastal floodplains generally do not consume mineral supplements. The forage available is generally of good quality, particularly the regrowth following rain early in the wet season. The soils are fertile, and based on marine sediments, so cattle do not look for salt.

Cattle grazing native pastures on the infertile solodic floodplains need to be provided with the same mineral supplements that they would require on any native pasture in the Top End. Cattle grazing fertilised improved pastures on these floodplains may not need to be supplemented.

**SUMMARY OF BEST PRACTICE**

- Provide cattle on the solodic floodplains with mineral supplements.

**Related topic**

Supplementation.
Floodplain Water availability and quality

Arthur Cameron, DoR Darwin

The supply of good quality drinking water on the floodplains is not a problem for most of the dry season.

During the early and middle of the dry season, drinking water for cattle is available, as there is abundant water in channels and creeks to supply cattle needs.

Towards the end of the dry season, supply of clean drinking water may be a problem as the channels and creeks dry out, particularly if there is no early rain. Some properties have springs which provide a flow of fresh water onto the floodplains all dry season. Other properties have constructed dams to supply water, or pipe water from tanks to troughs on the floodplains.

Magpie geese tend to concentrate on the remaining waters towards the end of the dry season. When they are in high numbers, magpie geese foul the water, making it unattractive for cattle to drink, which can lead to weight loss. Pigs can also contribute to fouling drinking water.

SUMMARY OF BEST PRACTICE

• Pipe clean drinking water to cattle on the floodplains if supply is low or water fouling becomes a problem late in the dry season.

Related topic

Water quality.
Floodplain Production

Arthur Cameron and Barry Lemcke, DoR Darwin

A bulk of good quality feed on the floodplains allows producers to grow or fatten cattle at a time when they would normally be maintaining weight on upland introduced pastures or losing weight on upland native pastures.

As the areas surrounding the subcoastal floodplains are of low productivity, producers are able to carry many more cattle on the floodplains than is sustainable in the wet season on their upland native pastures.

There are solutions to this dilemma.

One is to improve the adjacent upland areas by sowing introduced pastures such as Tully, Kazungula, Jarra or Strickland, which are more productive and can carry more cattle.

The other solutions involve importing cattle to graze on the floodplains in the dry season to take advantage of the potential weight gains.

Methods to do this include trading in cattle, agistment of cattle or sharing the value of weight gain obtained by agisted cattle.

Expected weight gains are of the order of a minimum 0.4 kilograms per head per day for the duration of the dry season. Most producers expect at least 0.5 kilograms per head per day for the duration of the dry season. This is influenced by the class of cattle which are on the floodplains, where they come from, their condition, and stocking rates.

Local cattle from floodplain properties, which are adapted to the local environment and conditions, tend to gain weight from the time they go onto the floodplains.

Cattle from elsewhere in the Top End, which are adapted to the environment, also tend to gain weight from the time they go onto the floodplains.

Cattle from south of the Top End or interstate, which are not adapted and may be coming off dry feed, tend to lose weight when they go onto the floodplains.

The period when the highest weight gains are recorded on the floodplains is during the early part of the wet season when there is high quality regrowth available from the perennial grasses. Liveweight gain often exceeds 1 kg per head per day at this time of the year.

Cattle on the subcoastal floodplains are expected to gain weight for 20 to 26 weeks each dry season, depending on the location of the floodplain and the stocking rate used.

On the solodic floodplains in their natural state, cattle gain weight at a lower rate for shorter periods. Production from fertilised improved pastures on solodic floodplains approaches that of the fertile subcoastal floodplains.
Fire Management
Wildfires on the floodplains are often caused by lightning early in the wet season.
There are less fire problems on the floodplains if they are grazed.
Fires on the floodplain are difficult to fight and control. The peaty layers which develop under grass pastures are difficult to put out when they burn. The cracking nature of the blacksoil floodplains allows oxygen to penetrate to depths of 2 metre or more. Fires can creep along underground plant stems and resurface behind firebreaks.

Wild pigs
Wild pigs can cause problems in a number of ways, including:
• physically destroying pastures
• bringing weed seed to the surface
• reducing trafficability through digging
• fouling drinking water
• attracting piggers who cut fences to gain access and periodically lose dogs on the property, which can cause problems with cattle.

Floodplain Producer Perspectives
 Arthur Cameron, DoR Darwin
Floodplain producers were able to provide us with specific comments about a range of topics. The consensus was that problems encountered on the floodplains can be managed.
Classes of animals grazed on the floodplains

While all classes of cattle, breeders, bulls, heifers, steers and weaners are grazed on the floodplains, the majority of cattle on the floodplains are steers agisted or traded for the live export market. Other animals grazed on the floodplains include buffalo and horses.

Owners of cattle grazed on the floodplains

Breeders and bulls are generally owned by the property. Steers can be owned, agisted or traded. Heifers and weaners can be owned or agisted.

Origin of cattle grazed on the floodplains

The cattle can come from the property, the Top End, the Victoria River District, south of Katherine, the Barkly Tableland, or from Queensland for traded cattle.

With the increasing cost of transport, the trend is for younger cattle to be trucked to the Top End for grazing on the floodplains. This is a strategy to turn cattle off at a time of the year when a price premium may be received.

Destination of cattle grazed on the floodplains

Breeders and bulls generally remain on the property. Heifers remain on the property or return to their property of origin if agisted. The majority of steers are turned off the floodplains directly to export. Weaners grazed on the floodplains may return to their property of origin if they do not reach the target weight for export.

Wild dogs

Wild dogs, including pig dogs lost by piggers can cause problems at times. Packs of dogs attack calves and weaners.

Weaning

- Wean twice-yearly on floodplain properties with the first round muster in December and the second round in June.
- Feed weaners smaller than 100 kg with an energy and true protein source.
- Handle weaners in yards, on horseback and foot, teach them to eat hay and to drink from troughs.
- Vaccinate all weaners against botulism, and with a “7in1” vaccine.
- Treat all weaners for worms.

Mustering

There can be a weight loss when cattle are mustered off the floodplains. The time when the cattle come off the floodplains is one of the hottest and most humid times of the year.

Mustering a paddock can be a problem if there are thickets of mimosa where cattle can hide.

Bogging

This can be a problem if the cattle are put onto the floodplains before they dry out at the start of the dry season or if there is heavy rain before the cattle come off at the end of the dry season. Cattle can get bogged in the channels and creeks where there is no vegetation because the water is too deep during the wet season.

Preferred grass

The grass the producers prefer depends on the depth of their floodplain. Generally, a combination of grasses which can be grazed at different times during the dry season is ideal.

The producers’ order of preference for grasses is, on balance, native hymenachne or para grass > wild rice or swamp ricegrass > Aleman grass > Tully > Olive hymenachne.

Transport

Road access after early wet season storms can be a problem when marketing cattle. If all of the cattle had to come off the floodplains at the same time, there would not be enough trucks to transport them.

There can be a weight loss in cattle being transported from the floodplains to the port for export.

During the wet season, access can be difficult when heavy rain leads to road closures. The predominantly dirt roads can be damaged by vehicles being bogged and made impassable. Some roads have weight limits put on them by transport authorities to prevent damage.
Crocodiles

Crocodiles do take some cattle, but generally not a significant number. Crocodiles do not need to eat frequently. They take cattle when they are crossing channels early in the dry season or when bogged late in the dry season.

Crocodiles can provide an income for properties where they breed, in the form of royalties from eggs collected from nests by crocodile farms.

Trespassers

Trespassers, including fishermen, hunters and piggers can cause problems on some floodplain properties.

Fishermen can damage barrages built to combat saltwater intrusion during the wet season when flooded.

Hunters and piggers can damage fences, leave gates open, or take cattle as killers for consumption.

Pests

Buffalo fly is the main pest encountered on the floodplains.

Diseases

Diseases do not appear to be a major problem on the floodplains. Worms and coccidiosis can be an issue in weaners, and Botulism can be a problem in unvaccinated cattle.

Mating systems and heifer management

On good floodplain pastures, mating can take place when the stock go onto the floodplain or calve on the floodplain in the May to July period.
This book summarises current recommended practices for cattle and station management in the Top End region of the Northern Territory.

The book is designed to be used as a reference, with links to how the reader can research topics in more detail. Further information on all subjects can be obtained from the Northern Territory Government, Department of Primary Industry and Fisheries.

This publication came about through the success of the 2009 Cattle and land management best practices manual for the Katherine region.

An initiative of the Northern Territory Government with funding provided by Meat and Livestock Australia. The information has been compiled from scientific data from the Northern Territory and elsewhere, with input and advice from experienced regional cattlemen.