

TIPS & TOOLS

NORTHERN CATTLE

How do I manage heifers pre-joining to improve reproductive performance?

A heifer management program is crucial for effective performance of northern breeding herds. Planning from pre-joining to calving is essential for overall reproductive management.

Why is pre-joining heifer management so important?

- Heifers are the foundation of the future breeding herd.
- Young breeders aged two to four years old constitute more than 40% of a typical breeder herd.
- First-calf heifers take longer to get back in calf than adult breeders. At 80 days post-calving, 60–70% will have cycled compared to 80–89% in cows.
- Calf loss between pregnancy diagnosis and weaning is highest in maiden heifers.
- Improving reproductive performance in young breeders will significantly improve the productivity of the whole breeder herd.

Lifetime productivity

The key to improving lifetime productivity of all breeders is to ensure they get the best start possible when they first enter the breeder herd. This depends on several critical factors:

- choosing the best time for your herd to calve
- ensuring replacement heifers are all cycling when the bulls go in
- restricting the joining period for heifers so they don't calve out of season
- implementation of strategies to minimise calf loss.



Selecting the joining date

Here are some key considerations when planning heifer management:

- Nutrition and the annual pasture curve is extremely important in many regions, especially where seasonal feed troughs last for extended periods every year in the dry tropics of northern Australia. Establishing the 'green date' is a very useful strategy (see section below).
- It's more problematic to set a joining date in regions of high rainfall variability.
- Producers will likely need to rely on dependable spring rainfall to target premium weaner markets in late autumn.

The green date

'Green date' is a useful concept in grazing systems where summer perennial grasses are the main component of the pasture base. It's usually defined as the number of days after 1 October to achieve a 70% chance of receiving 50mm of rain over a maximum of three days. It's based on soil temperatures and pasture responses to a specified amount of rain.

For more information, visit: climateapp.net.au

If using a 'green date', joining should commence one month after the 'green date' so that in most years, there will be a good body of feed available when breeders are lactating and cycling.

Critical mating weight

Critical mating weight is the target weight for maiden heifers when they're first joined to bulls to achieve an 84% pregnancy rate in a six-week joining period, or two complete reproductive cycles. This is based on the expectation that 60% should conceive within the first cycle of three weeks and that 60% of the remaining 40% will conceive in the second cycle of three weeks ($60\% \text{ cycle 1} + (24\% \text{ cycle 2}) = 84\%$).

Critical mating weight varies between breeds and within breeds but can be calculated if heifers are weighed just prior to joining and accurate foetal ageing is performed at pregnancy testing.

Both age and weight at puberty are highly heritable traits but age at puberty is affected by growth rate – faster growing animals reach their critical mating weight at a lighter weight and a younger age.

Weight at puberty is a very practical and easy to measure trait that commercial beef producers can establish for their own breed of cattle and implement in their heifer management programs (see table).

The critical mating weight has not been established for all breeds of cattle in northern Australia. It varies within breeds and is heavier than age at puberty because the first few reproductive cycles after reaching puberty are not always fertile.

Breed	Age at puberty (months)	Weight at puberty (kg)
Holstein - Friesian US	12 to 13	265-289
Holstein - Friesian AUS	8 to 12	200-230
Jersey	8 to 10	100-180
Brown Swiss	10 to 11	280-300
Charolais	12 to 13	320-355
Angus	13 to 14	320-355
Hereford	14 to 15	300-310
Simmental	11 to 12	320-330
Brahman type	17 to 27	330-350

Why aim for such a short joining period?

A common scenario in northern Australia is to select replacement heifers on size and looks without knowing if they attained their critical mating weight.

Bulls are put in with heifers just prior to the start of the wet season and joining occurs continuously into the dry season as the heifers grow and reach puberty. Conception rates when pregnancy tested in the middle of the year are usually good but no consideration has been given to the spread of the pregnancies and when they will calve down.

Consequently, a heifer that conceives late will fail to get back in calf the following season.

It's not *if* the heifer gets pregnant but *when* the heifer gets pregnant that determines lifetime performance.

Genetic improvement

Age and weight at puberty are highly heritable traits and while selecting heifers that get pregnant early will ensure genetic improvement is occurring, the main focus needs to be on sire selection. Use bulls with above average estimated breeding values (EBVs) for days to calving.

In addition, scrotal circumference in bulls is moderately genetically-correlated with age of puberty in heifers. If bulls with appropriate EBVs can't be sourced, selection of sires from breeders that have had good reproductive performance as young breeders is paramount.

Other considerations

Yearling mating (joining at 15 months of age) can significantly improve profitability; however, it's closely related to nutrition. A general rule of thumb is that weaning weights >240kg and annual growth rates >150kg/year are essential. On poorer country, feed inputs become too expensive and breeder re-conception rates during first lactation can be very low if additional feed is not supplied.

Dystocia is most common in maiden heifers as the calf is too large for a small pelvic opening which is not fully developed. Instigate a management plan based on bull selection (low birth weight and positive calving ease EBVs). High levels of protein in mid-semester increase

foetal weight but this can be difficult to manage in practice. Pelvimetry identifies heifers with small pelvic areas but cannot predict individual cases as the calf size is unknown, but assists in reducing the herd prevalence.

Spike feeding will improve re-conception rates of first-calf heifers. Protein meal supplementation to maiden heifers in their last trimester of pregnancy can lift re-conception rates by about 10%.

See the heifer management calendar on page 4 for an example of where spike feeding can fit into the plan.

It may take several years to achieve an ideal heifer management strategy and even longer for the benefits to flow through the breeder herd, but the improvements in herd productivity will justify the effort.



The heifer management plan

Pre-joining

- Establish a joining date and plan a strategy to achieve critical mating weight by that date.
- Identify cost-effective strategies to reach critical mating weights. For example:
 1. Conservatively stock heifer paddocks and supplement if necessary during the dry season prior to joining.
 2. Assess phosphorus status of the heifer paddocks and supplement during the growing season if deficient.
 3. Monitor faecal egg counts and drench if required.
- Purchase bulls or ensure home-grown bulls have had a Bull Breeding Soundness Examination and are vaccinated against vibriosis and pestivirus or are not a persistently infected animal. If dystocia is an issue, choose bulls with low EBVs for birth weight.
- Perform a risk assessment for all common diseases and vaccinate where necessary.
- Put bulls in either just before the wet season (where it's difficult to get them out at the start of the joining period) or a month after the green date.
- Over-mate heifers i.e. join more than required and make final selection on foetal ageing results.

Joining period

- Monitor bulls routinely for sickness, injuries or absenteeism.

Post-joining

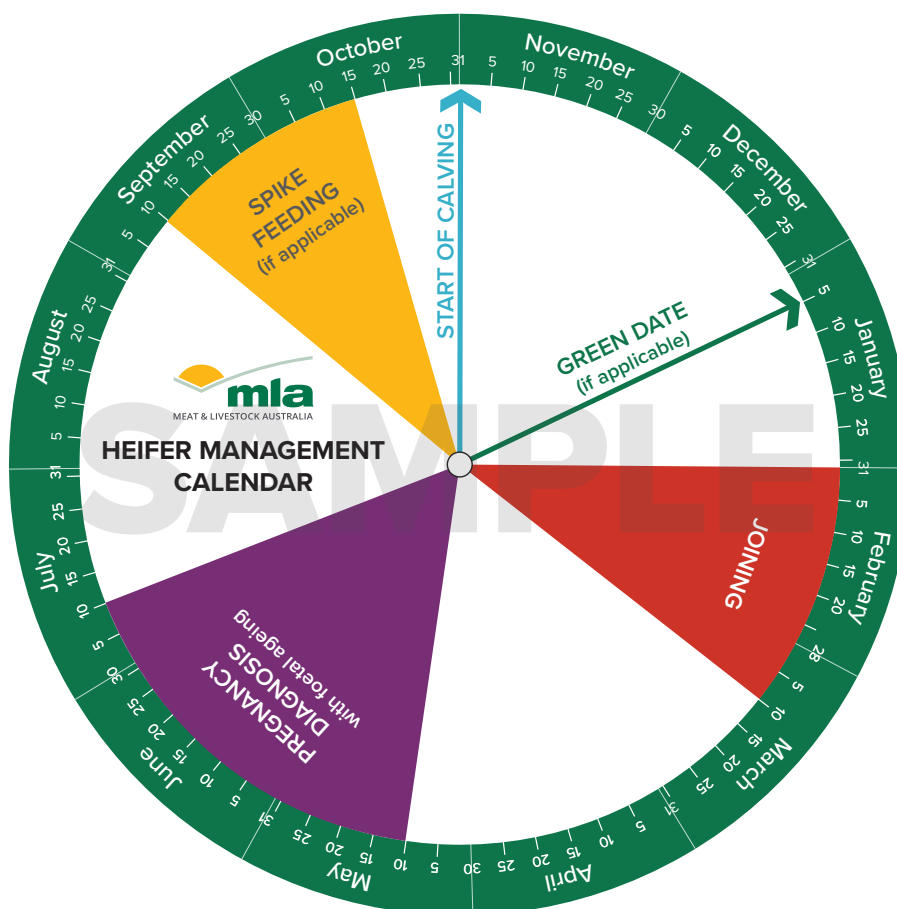
- Pregnancy test heifers about four to five months after the start of the joining period and insist on foetal ageing when the pregnancy diagnosis is performed.
- Select replacement heifers on temperament, then on stage of pregnancy. Attempt to retain as many as possible that conceived early in the joining period.
- Leptospirosis is a potential workplace health and safety issue. If implementing a program, it's best to vaccinate pregnant replacement heifers at pregnancy diagnosis to ensure good immunity.
- If conception rate of first-calf cows is a major problem, consider a protein meal supplement for heifers during their last trimester of pregnancy. Aim for good nutrition but avoid over-fat heifers.

Calving

- Ensure heifers have shade in their paddock.
- Avoid mustering around calving as this can increase calf loss.
- Avoid handling animals during extremely hot weather.
- Prepare to wean early if seasonal conditions are poor and heifers are losing body condition.

Heifer management calendar

See figure below for a sample heifer management calendar in the northern tropics. To create your own calendar wheel, see instructions on page 5.



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You can download the full Tips & Tools suite at:
mla.com.au/reproductiveperformance, including:

- What females should I sell?
- What joining system should I use?
- What's causing reproductive loss?

Geoff Niethe

E: g.niethe@bigpond.com

Nigel Tomkins

E: ntomkins@mla.com.au

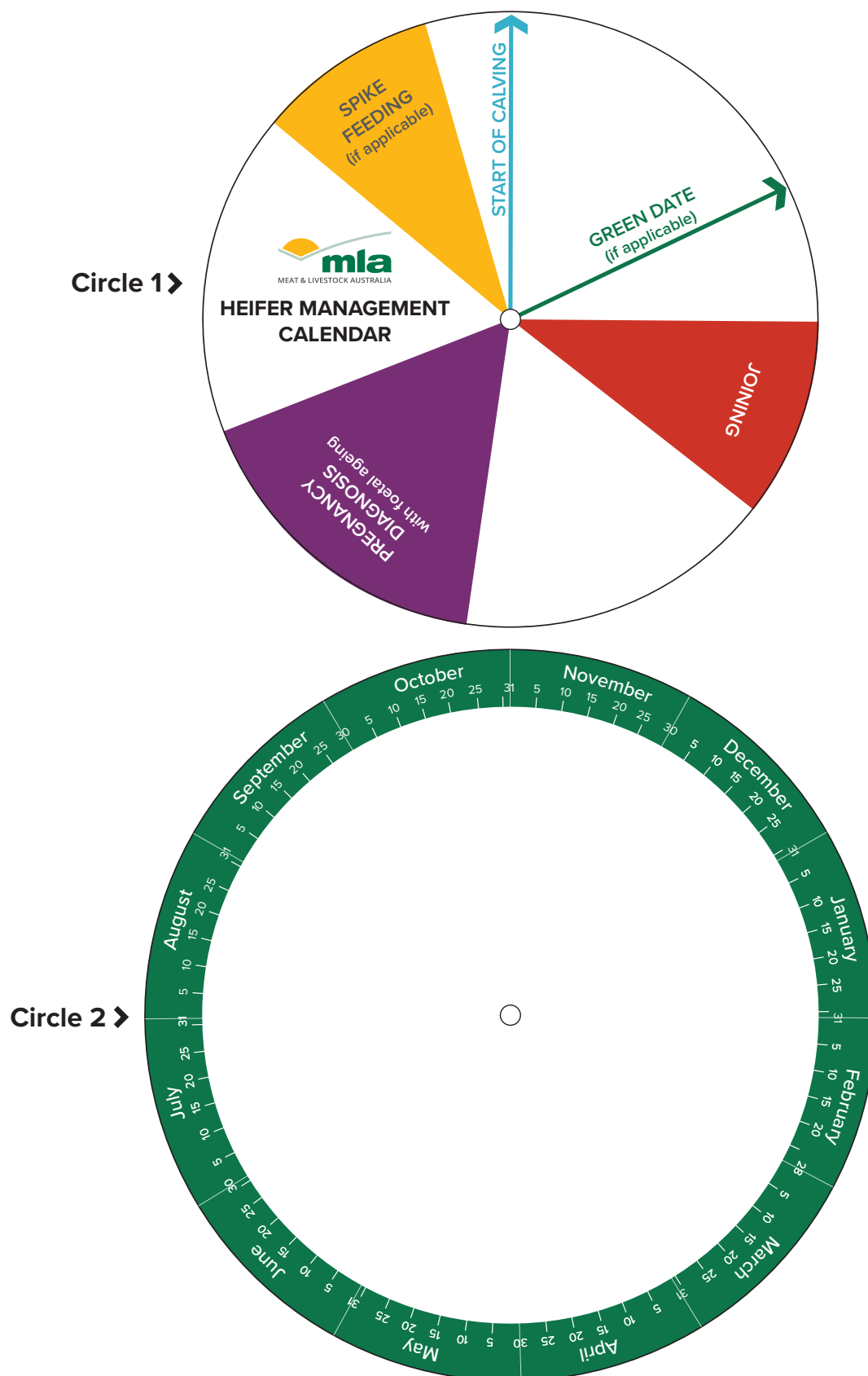
Level 1, 40 Mount Street,
 North Sydney NSW 2060
 P: 1800 023 100
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You can create your own heifer management calendar by cutting out Circle 1 and Circle 2.

Step 1 Cut out both circles. Place Circle 1 on top of Circle 2 and secure by placing a thumb tack in the centre (see small white circle in the middle of Circle 1).

Step 2 Manually adjust the calendar by spinning Circle 1. Line up Circle 1 and Circle 2 so that the red 'Joining' triangle aligns with your desired joining period.



TIPS & TOOLS

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What females should I sell?

Meat eating quality and steer sales are a major focus of most beef enterprises but it's the price received from the sale of females that has a massive impact on profitability.

Why is selling the right females so important?

- high performing breeders mean a high performing herd
- more feed and resources available for the productive females
- improved genetic progress and herd structure (i.e. quality not quantity).

If breeder mortality rates are low, female sales should represent half of the total turn-off and a significant component of the gross income. The challenge is to carefully plan how they're presented for sale in order to maximise the price received for each cow and heifer that exits the farm gate.

Culling breeders in **control-mated** and **segregated joining systems** should be straightforward. The key criteria are usually:

- inability to produce a calf
- early stage of pregnancy

- old age
- bad temperament
- poor udder function (e.g. no bottle teats).

However, in **continuously-joined systems**, breeders are usually run in mixed age groups and assessed once or twice a year when mustered. When a mob of breeders presents with a wide range of pregnancy statuses and body condition scores, culling becomes more problematic. Decisions need to be made as breeders pass up the race or through the drafting yard.

The main issues (other than fertility, age, temperament and conformation) to be considered in determining which breeders to sell include:

- high breeder cow mortality rate
- lack of market opportunities
- inability to meet market specifications
- high cost of replacing a maiden heifer
- low pregnancy rates of first-calf cows
- poor seasonal conditions.

Minimising cow mortality rate

In northern Australia, minimising breeder cow mortality rates is critical to achieving a successful business outcome. Profits are much more sensitive to changes in mortality rates than in reproductive efficiency.

The process of selecting which breeders to cull becomes a balance between retaining enough cows to produce sufficient weaners and ensuring stocking rates don't exceed carrying capacity. A 'cull nothing' approach results in overstocking and increased mortality rates; profitability is compromised when all breeders, or the wrong breeders, are retained. More importantly, when cows needing help to survive are not identified and subsequently perish, their potential sale value is never realised.



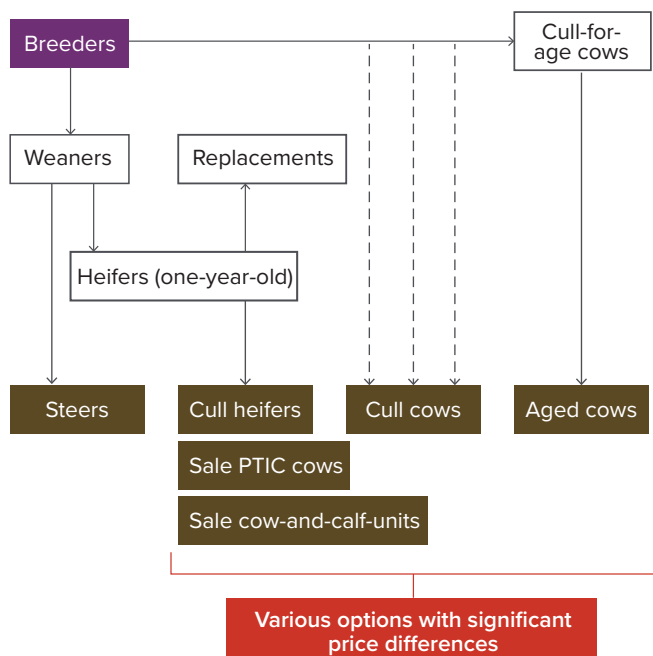
Market opportunities

The importance of increasing the average price of female sales was demonstrated by Niethe and Holmes (2007) in a report on how the practice of spaying surplus females improved profitability.

In many situations, the improved average price of all females sold more than compensated for the decline in animals weaned and subsequently available for sale. This study highlighted the value of considering all options and carefully managing the female turn-off to improve overall station profitability.

The significant price differentials between classes of animals represent both a challenge and an opportunity. The options for selling females include cull heifers, cull cows, sale PTIC (pregnancy tested in calf) cows, sale cow-and-calf units and cull-for-age cows.

Decision tree for continuously-mated herds with adequate number of replacement heifers



Market specifications

Before consigning cull females for processing, check the processor grids and ensure the animals are more than 180kg dressed weight. Stage of pregnancy influences females dressing percentage, which is always lower than males. A safe dressing percentage to apply (including late pregnancies) is about 48%. For example, the minimum fasted body weight is 375kg ($180\text{kg} \div 0.48$).

If cattle are weighed soon after yarding, an additional 7% should be incorporated into the calculations to account for shrinkage i.e. breeders should weigh more than 401kg when yarded to ensure they are above 180kg dressed weight at slaughter.

Maximising cull breeders' sale price can be the most difficult exercise in a breeding operation and forward planning is usually required e.g. booking processing space, having spare paddocks to hold cull cows, engaging a spay contractor and exploring feed opportunities to fatten light animals.



The cost of replacement heifers and pregnancy rates in first-calf cows

Having adequate pregnant replacement maiden heifers available to swap for unproductive breeders helps crush-side decision-making about what animals to cull.

A two-year-old replacement heifer will not produce a weaner for an additional 18 months after joining, so her running cost during this time almost doubles her value to the breeding herd. She is often lighter after raising a weaner and is 18 months older than she was at joining, but her real value as a sale animal can be considerably less than it was as a maiden, despite all the costs associated with running her.

On the other hand, there's no time lag for an adult breeder between conception and weaning if she conceives while rearing her calf. In other words, the business cost of a replacement heifer includes a breeding potential value, which is rarely recognised in the marketplace and is not present as a cull-for-age breeder. This is why heifers that fail to reconceive as a first lactation breeder can be given another chance prior to culling from the herd, as they're on an equal footing to a maiden heifer that is yet to enter the herd.

While this policy is not recommended when producing herd bulls, it's often necessary because of the frequent poor performance of first lactation breeders in northern Australia and the price differential between an unjoined maiden heifer and a first-calf cow which has failed to reconceive.

Seasonal conditions

Key factors driving culling decisions are seasonal conditions, pasture availability and expected time until the break in the season. For example, a first round muster in April after a failed wet season demands a different strategy to a similar muster after an average-to-good wet season, or a second-round muster just before the start of the wet season or green date.

General culling guidelines

- **Bad temperament:** Breeders with poor temperament are a potential workplace and safety issue and should be removed as soon as possible.
- **Deformities:** Females with deformities such as bottle teats, cancer eyes and ingrown horns should be removed to ensure animal health and welfare of the whole herd is maintained at a high standard.
- **Fat and non-lactating (dry) cows:** Many of these animals will be pregnant at the first muster so it's highly likely they will calve out of season and not reconceive the following year. Research shows that if a breeder lost their calf last season, there was a greater chance she would lose one again. Breeders more than eight months pregnant should not be trucked due to animal welfare concerns. For more information, see MLA's *Is it fit to load?* guide at mla.com.au/fittoload.
- **Aged cows:** Prior to commencing the muster, the decision should be made to cull animals with a broken mouth. Aged cows are generally in poor condition after lactation, so forward planning is needed to manage them. Animals that are losing teeth are extremely difficult to fatten and sell, and their weaner offspring are often lighter in body weight. To avoid having unsaleable animals, all properties should adopt a policy on culling aged cows.
- **Maiden heifers:** Maidens that are above their critical mating weight and have failed to conceive should be culled, as their future long-term productivity is usually less than average.
- **All breeders:** If the wet season has failed or a drought is highly probable, all breeders should be pregnancy tested and body condition score assessed. Those that are body condition score ≤ 3 and/or are more than five months pregnant will need special attention; a saved paddock, supplementation, agistment or sale.



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Geoff Niethe

E: g.niethe@bigpond.com

Nigel Tomkins

E: ntomkins@mla.com.au

Level 1, 40 Mount Street,
North Sydney NSW 2060
P: 1800 023 100
mla.com.au



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TIPS & TOOLS

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What's causing reproductive loss?

There are many reasons for foetus and calf loss and unless calves are examined soon after abortion or death, it's extremely difficult to accurately determine the cause. Many calf loss issues are related to management and environment e.g. predation, mustering technique, husbandry procedures, calf scours, dystocia, misadventure and calf diseases. Careful observation and attention to detail will help investigation.

Why is understanding the causes of reproductive loss so important?

- each breeder cow that fails to produce a weaner can represent a reduction in business income of more than \$400/head
- animal welfare implications pose a risk to beef industry's reputation among consumers
- knowing the cause of reproductive loss is the first step towards defining the most effective solution; solving underlying problems will contribute to whole-herd productivity.

How do we know a problem exists?

- a disappointing result at pregnancy diagnosis
- less calves than expected at weaning time
- aborted foetus or deceased calves are observed.

Addressing the problem step-by-step

A: On-farm diagnosis

- determine when losses are occurring – pregnancy diagnosis is essential to determine if it is failure to conceive, abortion or losses at or after calving
- examine last year's calf drop – consider numbers, age range and any differences this year
- assess breeder body condition and pastures

B: Sample collection and laboratory confirmation

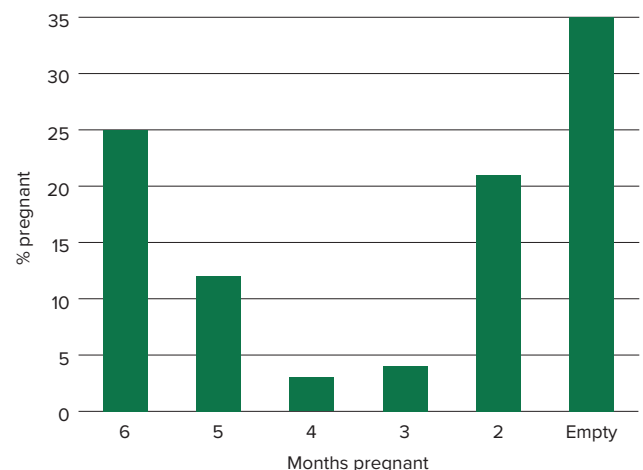
- submit samples for analysis from non-pregnant breeders or deceased calves
- seek help to interpret laboratory findings.

A: Tips for on-farm diagnosis

1. **Last year's performance:** A quick look at the age distribution of the calves in the yard should provide an indication of the conception picture obtained by foetal ageing results and the expected calving pattern for next year.

2. **Cow body condition:** If pregnant cows are in body condition score <2.5 (on scale of 1–5), nutrition could be an issue – check pastures.
3. **Pregnancy status of different age groups:** Lower pregnancy rates in first-calf cows than mature cows also indicate nutritional issues.
4. **Maiden heifer performance:** Low pregnancy rates in maiden heifers may mean they were below critical mating weight but if above, this is a good indicator disease exists as these animals are the easiest group to get pregnant e.g. a saddle pattern in the pregnancy rate curve indicates a venereal disease such as vibriosis (see figure).

Classic 'saddle shaped' pregnancy distribution in herd of maiden heifers with vibriosis

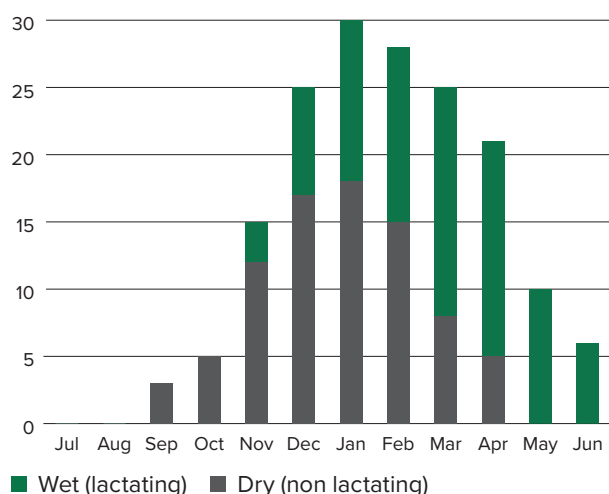


5. Pregnancy and lactation status (wet or dry cows): For continuously-joined herds in northern Australia, the classic pattern is dry (non-lactating cows) calve early while lactating cows in lighter condition calve later in the wet season (see figure).

6. Fat breeder cows: Most fat cows should be pregnant. A non-lactating cow at pregnancy diagnosis suggests abortion or calf loss. Fat, non-lactating and non-pregnant cows suggest a permanent infertility problem.

7. Bull evaluation: A completely infertile bull is easy to detect in single sire herds with indications including zero pregnancies or obvious defects e.g. preputial prolapse, swollen penis, lameness or illness history. The sub-fertile bull poses the most challenges and can be readily diagnosed with a Bull Breeding Soundness Examination. Individual bull assessment is less critical in multiple sire herds if the bull percentage is $\geq 2.5\%$.

Expected calving pattern of dry (non-lactating) and wet (lactating) breeders in continuously joined herds



Source: NT Technical Bulletin

Neonatal (newborn) calf loss

Causes of neonatal calf loss are difficult to determine in extensive beef operations as they're often first detected as breeders "fail to raise a calf" at a weaning muster.

Assessing breeders that have lost calves

- Cows that have lost calves at or around birth will often be in better body condition than the rest of the herd. They will have watery/milky secretions in their udders.
- Heifers that have lost calves will display some degree of teat development compared to heifers that have aborted.
- Heifers that are sterile or abort early have very small teats often known as 'rose bud' teats. If fertility and/or calf loss problems persist, contact your local veterinarian for assistance.

B: Sample collection and laboratory confirmation

Some reproductive diseases are infectious to humans – protective clothing and strict hygiene are essential. When collecting samples, focus on:

- 1. Cow history:** Accurately record identity, PIC (Property Identification Code), age, pregnancy status, lactation status and body condition score for all animals sampled.
- 2. Calf/foetal/placenta specimens:** If a fresh foetus, deceased calf or placenta (afterbirth) is available, these can be collected, preferably by a veterinarian with the appropriate transport and storage. If a veterinarian is unavailable, fresh specimens can be kept chilled (refrigerator or on ice) until one can be contacted.
- 3. Cow samples:** Approximately 15–30 blood samples and vaginal swabs should be collected from non-pregnant and pregnant cows in mobs. Remember to keep records for each cow sampled.
- 4. Bull samples*:** Preputial swabs should be collected from bulls where the pregnancy rate is low or where a venereal disease is suspected in maiden heifers.

* These samples are not routinely collected in a Bull Breeding Soundness Examination.

Q Interpreting laboratory findings

With most reproductive diseases, the investigation occurs many months after the incident and so the presence of antibodies or antigens (infective agent) may provide a diagnosis.

1. Pestivirus/bovine viral diarrhoea virus: Many Australian cattle herds are exposed to the virus and show evidence of previous infection but frequently with no reproductive loss. The antibody titres obtained help interpret the significance of the findings:

titres 1 and 2 = low or old exposure to the virus

titres ≥ 3 = high or recent infection i.e. the past 1–9 months

Titres ≥ 3 in non-pregnant animals indicate a pestivirus infection which caused infertility or early abortion during mating. Pregnant animals with titres ≥ 3 may be carrying an infected calf which could die before weaning or may survive as a 'persistently infected' carrier animal. These animals could spread infection to other females. The ear notch test detects virus/antigen and is used to find infected animals that spread the disease.

2. Vibriosis/campylobacteriosis: Vaginal swabs placed in transport media and kept chilled are best for diagnosis. Preputial swabs can also be collected from the bulls by a veterinarian.

- 3. Trichomoniasis:** The best samples to collect are vagino-cervical mucus from heifers, pus from uterine discharges and preputial samples. The organism can sometimes be detected directly by microscopy.
- 4. Bovine ephemeral fever (three-day sickness):** Three-day sickness is commonly seen in endemic areas and interpretation is difficult. A virus neutralisation test detects antibodies and titres >40 are considered positive while those >640 have been recently infected. Sample both pregnant and non-pregnant animals to determine if the viral infection has caused the abortion.
- 5. Leptospirosis:** Abortion usually occurs in the last trimester of pregnancy. The most common isolates are Pomona and Hardjo which are detected using the microscopic agglutination test (MAT). Samples with a MAT titre of >100 for each serovar are considered positive where no vaccination has been used and samples ≥800 indicate recent infection. Vaccination does induce MAT titres of ≥200 for about six months afterwards. Two blood tests about 2–4 weeks apart ('paired sera') are recommended, with the first sample taken as close as possible to the time of infection.
- 6. Neosporosis:** Although infection is widespread in some regions, evidence of significant foetal/calf loss is only occasionally observed. Testing is very accurate.
- 7. Akabane disease (curly calf syndrome):** Common in endemic areas but losses are hard to determine. Calves are born alive but deformed or weak and unable to suckle. A post-mortem examination of the calf and sampling the brain and spinal cord, is the most effective diagnostic. Other insect-borne diseases such as aino virus can cause similar losses.
- 8. Vitamin A deficiency:** This is mainly seen in open downs country following a failed wet season where little green pick is available and top feed is scarce. Post-mortem examination of the calf and cranial cavity, submitted with brain and liver to the laboratory, is best.
- 9. Genetic defects:** Hereditary defects occur in all cattle breeds but some are strongly associated with certain breeds. Most occur rarely and are of little economic importance, but some can cause significant losses. Genetic marker tests are available to identify carrier animals and preferably the sire and dam should be tested. Obtain information from breed societies on genetic defects affecting your breed.

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Geoff Niethe

E: g.niethe@bigpond.com

Nigel Tomkins

E: ntomkins@mla.com.au



Level 1, 40 Mount Street,
North Sydney NSW 2060
P: 1800 023 100
mla.com.au



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What joining system should I use?

Ideally, beef breeding operations should be aiming to produce one well-grown weaner per breeder per year. This is a challenge as reproductive performance is affected by climate, seasonal variations, soil type, cattle breed, animal health and management. Consequently, several different mating systems are used in Australian beef herds:

- controlled joining
- restricted joining
- segregated joining
- continuous joining.

Why is choosing the right joining system so important?

- every breeding operation has different requirements; producers need to know what works best for their enterprise
- just because you've been using the same system for years doesn't mean it will always be the right match for your business - a cost-benefit analysis can determine what would work for you.

Controlled joining

Controlled joining ensures the annual calf drop occurs at a specific time each year. The joining period is determined by the ideal time for calving and weaning and varies in length (determined by environment, herd performance and management intensity). On good land types in favourable environments, the joining period can be about six weeks (two cycles) for heifers and nine weeks (63 days) for adult breeders. In less favourable environments, 16 weeks may be more appropriate.

Why use controlled joining?

The advantages are:

- ability to match peak lactation demands with optimum pasture availability
- more even lines of weaners to sell
- improved chance of getting more heifers to critical mating weight
- ease of management, including less mustering and decreased labour costs
- timely pregnancy diagnosis to inform management and marketing decisions
- reduced supplementation costs
- reduced calf loss (mustering during calving is avoided)
- improved bull and replacement heifer selection opportunities.



Considerations

Controlled joining systems won't suit everyone. If <70% of mature breeders are calving every 12 months or are pregnant within four months of calving, another mating system should be considered. Important considerations include:

- determine when joining should start; the "green date" is useful if there are distinct wet and dry seasons each year, however, where pasture quality and availability is more uniform, other factors such as market timing will influence the decision
- a secure heifer paddock is essential to ensure replacement heifers are synchronised with the main breeder herd
- good mustering efficiency
- pregnancy test (at weaning) is an important strategy for culling empty breeders
- effective management of fertility diseases such as vibriosis, trichomoniasis, leptospirosis and pestivirus
- a secure bull paddock is preferable but not essential
- lack of breeder body condition is the principal cause of failure of controlled joining so good grazing and weaning management are required to ensure cattle maintain adequate body condition
- all bulls should undergo Bull Breeding Soundness Examinations prior to joining
- careful planning over several years is required to change from one mating system to another.

Restricted joining

Restricted joining is where bulls are removed to prevent calving at particular times of the year, usually the middle of the dry season. It suits enterprises where:

- a tight calving period is unachievable
- cows are joined at a set time each year but over a longer period e.g. >5 months
- bulls can be removed from the herd.

Why use restricted joining?

In regions where pregnancy rates in lactating cows are low, weaning at the first round of mustering can induce cows to cycle. If bulls are removed then, out of season calves are avoided. Advantages include:

- lower breeder mortality rates
- reduction in supplementation cost
- no out of season calves.

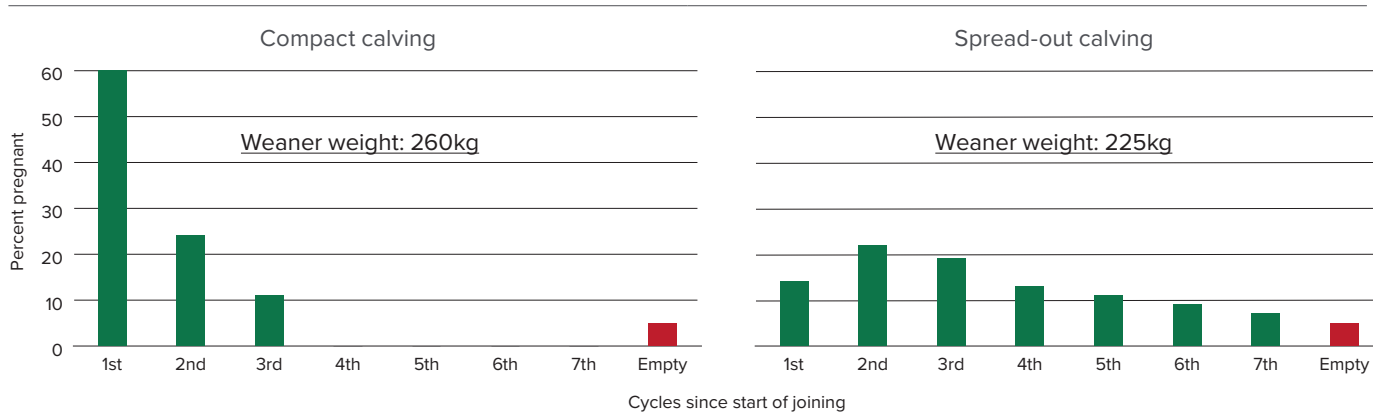
Considerations

- it accommodates a larger proportion of breeders that are unable to have a calf every 12 months
- two rounds of mustering are still required
- larger variation in weaner weights.



There are clear benefits to establishing a compact calving pattern (see figure).

Compact calving versus spread-out calving – same pregnancy rate (95%) but 35kg difference in weaner weight



Source: Sykes and Stafford

This equates to 3,325kg of weaner weight in a 100-cow herd or approximately \$10,000 if weaners are valued at \$3/kg live weight.

Segregated joining

Segregated breeder management is practised where it is difficult for most breeders to achieve a 12-month calving cycle, which is:

- usually in herds where the P4M (pregnant within four months of calving) rate is between 40–70%
- where there is high rainfall variability.

Why use segregated joining?

The advantages of a segregated breeding system include:

- reduced supplementation costs
- reduced calf loss as mustering breeders with baby calves is avoided
- potential to improve herd efficiency by systematically identifying and culling non-productive rather than just older breeders
- removing bulls is unnecessary, except from maiden heifer paddocks
- decreased breeder mortality rates.

Considerations

There are certain requirements for segregated joining. They are:

- adequate infrastructure and sufficient paddocks
- accurate foetal ageing to establish calving groups
- a good heifer program to ensure first-calf cows get off to the right start
- segregated joining is usually unsuitable if pregnancy rates in lactating cows is below 40–50%.

An example of getting started with segregation at an August muster – three groups established

Foetal age at August	Expected calving window	Management options at pregnancy test this year	Next year's management plan
5–7 months pregnant	Oct–Dec this year	Wean calves if not already done Move cows to new paddock	Wean in May
2–4 months pregnant	Jan –March next year	Wean calves – all will be at least four months old	Wean in August (or earlier if possible)
Not detectably pregnant	May–July next year	Non-lactating (fat) cows sold this year – wean all lactating cows October – cows stay in paddock	Cows over five years sold at end of February; young breeders pregnancy-diagnosed and pregnant ones retained

Continuous joining

Continuous joining is also known as natural breeding or uncontrolled mating. Mustering is a major operational expense with two rounds of mustering usually undertaken – the first round occurring between March and May and the second between August and October.

Considerations

- suits properties with uncontrolled surface waters and/or very low stocking rates (2–4 AE/km²) and minimal infrastructure
- good heifer management is still important to ensure replacement breeders get a good start
- goal is to minimise out of season calves as these breeders typically have lower re-conception rates and higher mortality rates
- the benefits of early weaning occur if performed prior to the end of June.

Changing your system

Before changing systems, a cost-benefit analysis is advised as often additional infrastructure is required and key management strategies such as timing of weaning, disease management and bull removal need to be well-planned. Changes in joining periods usually need to be implemented gradually to minimise the impact on weaning rates during the changeover.



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Geoff Niethe

E: g.niethe@bigpond.com

Nigel Tomkins

E: ntomkins@mla.com.au

Level 1, 40 Mount Street,
North Sydney NSW 2060
P: 1800 023 100
mla.com.au



TIPS & TOOLS

NORTHERN CATTLE

Assessing animal health status

All livestock owners in Australia have a duty of care under animal welfare legislation to ensure reasonable protection from disease for all animals they own or manage. It's important stockowners know the enemy (disease) to demonstrate compliance.

The on-farm biosecurity plan recommends 'report unusual signs of disease as soon as possible to your vet or local animal health authority.' While this is by far the best solution, in practice it seldom happens due to:

- failure to recognise a problem
- distance
- cost
- dead animals found too late
- availability of suitably qualified personnel.



The goal is to identify the causes of disease and poor performance so that animals can be provided with reasonable protection from disease, and necessary control and management measures can be implemented.

More disease problems remain undiagnosed from 'not looking' rather than 'not knowing' – animals don't die without a reason. The challenge is to find the cause.

The most effective way of keeping animals healthy is to prevent new or exotic diseases brought onto the farm in the first place.

Note: If a serious exotic disease is suspected, immediately contact Emergency Animal Disease hotline on 1800 675 888 or visit animalhealthaustralia.com.au/what-we-do/emergency-animal-disease/

Precautionary measures prior to starting



Wear protective clothing at all times such as disposable gloves, rubber boots and overalls. After the necropsy, incinerate gloves and thoroughly wash boots and overalls.



Treat every animal assigned to a necropsy as infectious to animal and man.



If you live in the anthrax belt and an animal dies suddenly with dark blood discharging from the nose and/or anus – **do not open the carcass.**



Perform the necropsy as soon as possible after the death of the animal. Post-mortem decomposition sets in quickly in large animals and the problem is exacerbated further in hot climatic conditions.



Eating, drinking and smoking are prohibited at the necropsy.



Prior to starting the necropsy, check the necropsy kit thoroughly to ensure all the necessary items are present for the job. A sharp knife, steel and an axe/pruning shears/saw are essential. A bucket of water, soap, brush, disinfectant, notebook and a digital camera or phone are also necessary components. Having a second person on-hand to take notes and photographs will prevent small details from being missed.



After the necropsy, dispose of the animal's remains according to your biosecurity plan.



Where an exotic or infectious disease is suspected, inform a veterinarian and management immediately.

Helpful hints

Here are seven tips to assist with the diagnosis.

1. History

Be meticulous about getting a good history, including:

- individual identification (ear/NLIS tag)
- age
- sex
- breed
- body condition
- climatic conditions
- length of time on property
- individual/mob recent treatments
- feed/ration changes (including paddock shifts)
- supplements
- access to toxic plants
- fertiliser application and crop spraying
- insect activity.

2. First impression

Observe and record external appearances such as discharges from eyes, ears, nose, mouth, anus, vulva, prepuce and navel. Note any:

- skin lesions
- colour of gums and conjunctivae
- rubbing of hair
- paddling of limbs (marks on the ground under the animal's feet).

3. Time since death

Rigor mortis (stiffness of the corpse) provides an indication of time since death. It usually sets in within hours and disappears after a few days.

Higher temperatures and exercise of muscles accelerate the process e.g. Tetanus or strychnine poisoning is accompanied by immediate rigor mortis.

To assist with establishing time of death look for blow fly eggs that are 1–2mm in length, they hatch after 24–45 hours then quickly grow to become first stage larvae (maggots).

4. Necropsy

If a qualified person is not available, then after observing the necessary precautions (see above), proceed to do a quick post mortem ensuring the animal is lying on its left side.

Examine the main organs which are easy to locate such as the mouth, lungs, heart, liver, kidneys, spleen and bladder.

Mention each organ examined for the sake of the note taker. Describe any lesion/abnormality (size, colour, consistency/texture), but also note when there is no abnormality to be seen (i.e. normal).

Initially, avoid cutting into the rumen or the intestines as gut content may contaminate the whole field.

Take photographs of the main organs prior to examining the gut content. If submitting samples, use clean glass bottles or zip top bags and put on ice immediately (do not freeze).

5. Gut

Open the rumen and intestines last. Take note of plant material in the rumen and observe any reddening/blood in the gut wall along with gut content.

6. Records

Send history, photos and records to your local vet or departmental officer.

7. Opening the animal

The key to an easy and successful necropsy is a sharp knife. Much energy is expended trying to perform the job with a blunt knife as tiredness sets in, decreasing the observational powers of the operator.

When skinning the animal, insert the knife under the skin and cut from the bottom up. Dirt, hair and manure quickly dull the edge of the blade.

Place the animal on the left side. Using a midline incision, cut from the mandible to the pelvic symphysis. Cut around the penis, mammary gland and testicles, leaving them with the lower half of the body.

Figure 1: Opening the animal

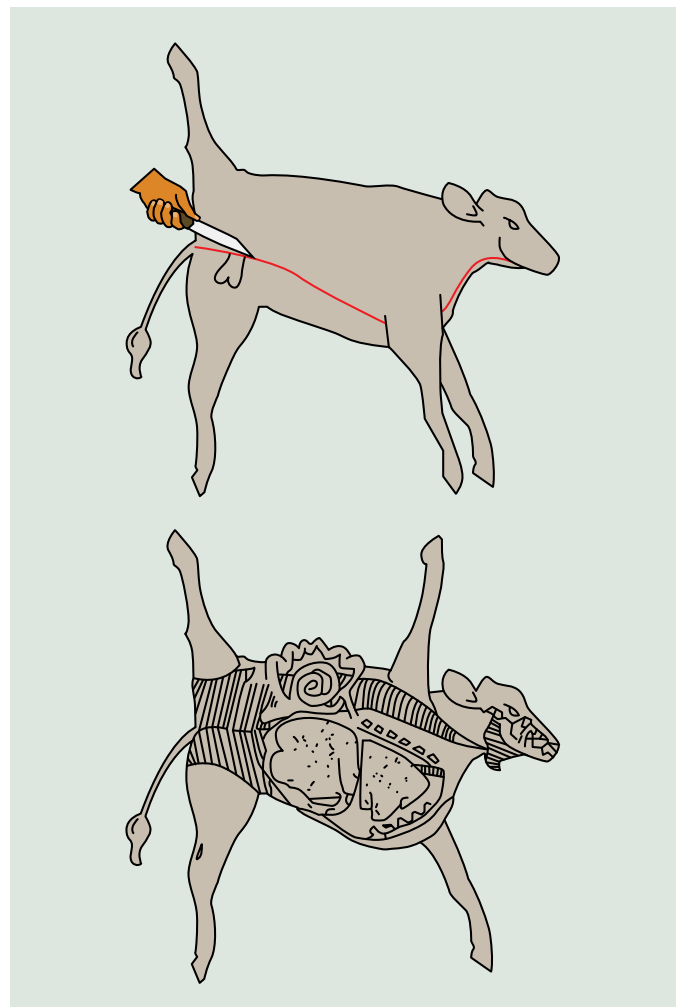


Image: Adapted from the Veterinary Handbook at veterinaryhandbook.com.au/ContentSection.aspx?id=44

Knowing normal assists recognition of the abnormal



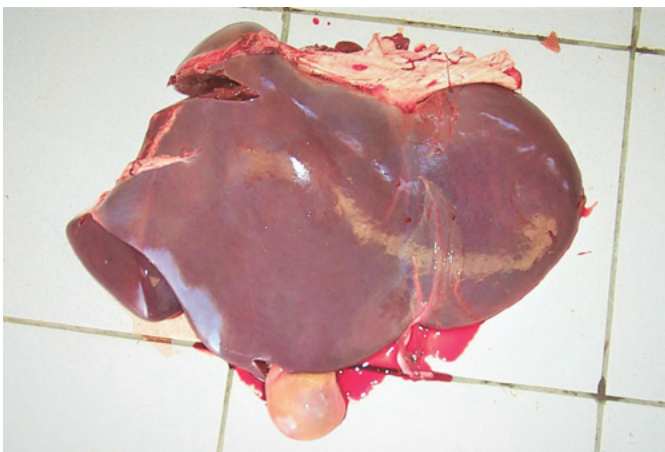
Lungs

A normal lung should be pink and spongy. If it is dark and solid, then this is typical of pneumonia. Pneumonia usually occurs in the ventral (lowest) lobes of the lung. This photo shows both a normal (right) and a diseased lung (left). A lung, which is lying on the bottom of the chest cavity, will often appear congested as blood gravitates to the lowest level after death. Cutting open the trachea can reveal inhaled foreign matter, or froth (e.g. with large lungworm infestation).



Heart

The normal heart is dark rose in colour, firm to touch and the blood vessels easily seen. A damaged or diseased heart will often display small blotchy haemorrhages on the surface. These will be around 1–2mm in diameter and be dark crimson in colour. Haemorrhages are often seen on the inside chambers of an affected heart once cut open.



Liver

Reddish brown colour and firm in texture. A normal liver has sharp, well-defined edges and folds easily. An affected liver will be swollen and the edges of the lobes are rounded and very taught. A jaundiced liver will usually be swollen and will be orange in appearance. Granular bile in the gall bladder is an indicator the liver has been affected.



Spleen

The spleen is located on the outer side of the rumen. A normal spleen is greyish mahogany in colour but the cut surface is granular and a deep mahogany. The organ is soft, the edges fold easily, and the outer surface slightly wrinkled. An affected spleen is swollen, firm and the edges rounded.



Kidney

The kidneys are often surrounded by fat and lie in the loins region. They are usually reddish brown in colour. Kidneys are a smooth, lobulated organ and firm in consistency. A kidney is best incised to determine if there are any significant issues. There are two layers inside, an outer section called the cortex and the inner is called the medulla.



Petechial haemorrhages

Petechiae are small haemorrhages that can appear anywhere on organs and under the skin. They usually indicate a febrile reaction caused by an infectious agent. They can also be associated with an agonising death. Increased reddening or inflammation is also associated with infection as opposed to bruising which is usually a chocolate colour.

More information

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- What's causing reproductive loss?
- How to do a calf necropsy.

Geoff Niethe

E: g.niethe@bigpond.com

Nigel Tomkins

E: ntomkins@mla.com.au

Tim Huggins

E: thuggins@mla.com.au

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North Sydney NSW 2060
P: 1800 023 100
mla.com.au



TIPS & TOOLS

NORTHERN CATTLE

How to do a calf necropsy

Valuable information can be obtained from a calf that has recently died. If no veterinary services are available, the following tips may assist in finding the cause. It's important to develop a logical and methodical approach when performing a calf necropsy.

Precautions and helpful hints

Before completing the calf necropsy, follow these precautions.

1. Avoid direct contact with tissues and body fluids to limit the risk of contracting zoonotic diseases such as Leptospirosis. The minimum personal protective equipment (PPE) should be elbow-length disposable gloves and a transparent facial shield.
2. Check to see where the mother of the dead calf is, as cows may become aggressive when their calf is being interfered with.
3. Identify the mother so that samples can be collected retrospectively (if needed) next time she is yarded.
4. Select a good spot for disposal (burial or burning) of the carcase when the examination is completed.
5. Refer to *Tips & Tools Assessing animal health status* when performing the necropsy. Follow the methodical steps outlined to ensure all major systems are examined.
6. Observe carefully, take notes and plenty of photographs. If collecting samples, use zip top plastic bags or small clean jars and keep chilled. Record other information such as approximate time of death, seasonal and environmental conditions.
7. If uncertain about doing your own necropsy, place the freshly dead calf in a clean bag, keep as cool as possible and take to your local veterinarian or laboratory if close by.

How to complete a calf necropsy

Step one: Determine the foetal age

Has the calf been aborted or is it full term? A foetus <8 months of age will have no hair. Foetus size can provide an idea of foetal age (see Table 1).

Table 1: Determining foetal age (months) by foetus size

Month	Foetus size similar to
2	Mouse
3	Rat
4	Cat
5	Small dog
6	Medium dog
7	Large dog
8	Calf (with hair)

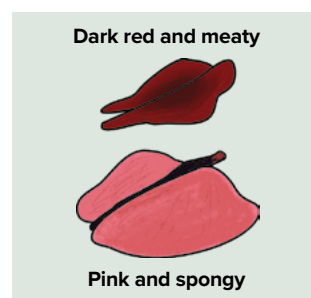


Image: steerplanet.com/bb/the-big-show/aborted-fetus-pics/

Step two: Determine if the full-term calf has been born dead or alive

A necropsy will determine if the calf has breathed air. If the lungs are:

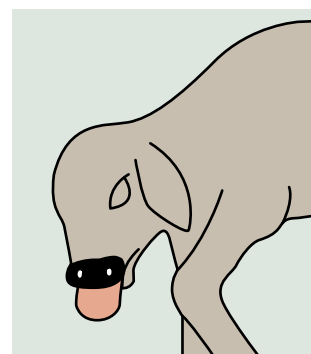
- pink and spongy (and float when a section is placed in water), the calf has breathed air
- dark red and meaty, the calf hasn't breathed air.



Step three: Determine if the calf has died during a difficult birth (dystocia)

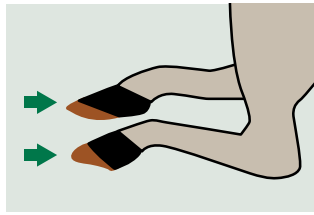
A difficult birth is most common in maiden heifers that deliver their first calf and can be characterised by:

- puffy head
- swollen tongue
- froth in windpipe
- bruising
- haemorrhages and hernias.



Step four: Determine if the calf was born alive but failed to walk

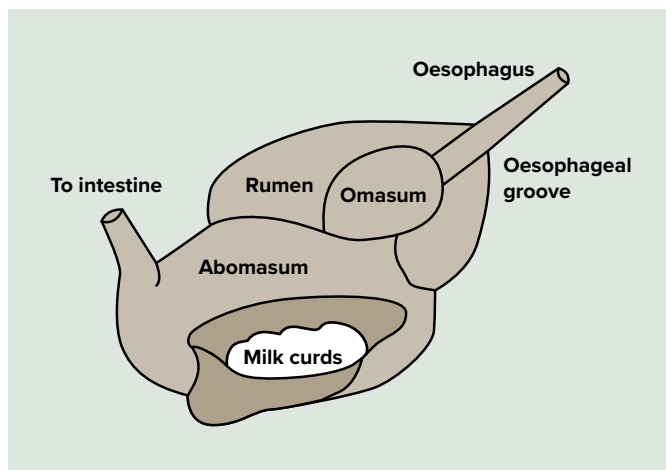
Look for hoof membranes, a soft gelatinous mass covering the bottom of the hoof (preventing damage to the birth canal), to determine if the calf was stillborn or weak at birth.



Step five: Determine if the calf has suckled the cow

Milk curds in the true stomach (abomasum) of the calf is evidence the calf has suckled. Absence of milk would be indicative of mis-mothering or starvation and/or dehydration (see Figure 1). Colostrum within the first eight hours of life is vital to achieve immunity.

Figure 1: Inspecting the calf stomach

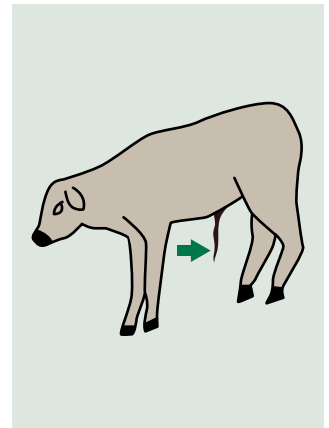


Step six: Determine how long the calf died after birth

Inspecting the navel cord is a good method to determine how long after birth the calf died.

If the navel cord is:

- prominent, reddish and moist than this suggests the calf died soon after birth
- dark, dry, shriveled and present than this suggests the calf was two to three days old
- oozing and smelly, than navel ill and-or septicemia is a likely cause of death.



Step seven: Look for other signs such as a struggle, predation or diarrhoea

Dags around the tail and faecal staining between the hind legs indicates diarrhoea. In baby calves, it can be yellow and pasty or blood tinged.

Signs of dehydration including sunken eyes, dull coat and poor skin elasticity are often associated with diarrhoea, mis-mothering or abandonment.



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Geoff Niethe

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