



Australian Cattle Veterinarians

Induction of parturition guidelines

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8.1 Induction of parturition

AVA Policy

Induction of parturition (calving induction) in dairy herds should only be undertaken for therapeutic reasons such as mismated heifers, downer pre-calving cows, high risk dystocia or malnutrition cases.

Background

Veterinarians should assist with and promote research involving cattle reproductive physiology and genetics to improve dairy herd fertility and to advise dairy farmers on management procedures that will replace the need for calving induction in the future. Calving induction is currently used in seasonally calving dairy herds to facilitate all cows in the herd to calve within a particular time frame. This enables cows to remain in the herd as long as possible. Welfare issues can arise for cows and calves if calves are induced prematurely.

Calving induction programs should only be used as an adjunct to a complete reproductive management program, adopting the significant advances in reproductive management technology that have been made in recent years. Calving induction should not be used as a substitute for good reproductive management.

Calving induction basically comes in two forms:

1. Planned calving induction where the animals to be induced are identified well in advance of the event (they have been early pregnancy tested) and are managed so that they can be induced to calve early in the calving season. Veterinarians work out the induction dates for their clients cows based on the early pregnancy test data. The cows are managed in such a way as to minimise the risks associated with calving induction, and because the induction is done early, almost all calves are stillborn. The reproductive performance of cows induced to calve early in the calving season has been shown to be similar to that of their cohorts calving naturally at the same time. This improves the cow retention rate (reduces the cow cull rates) in the herd and is the main reason for using calving induction.
2. Late calving induction - in this situation the farmer will often present groups of cows that have not calved by fairly late in the calving program and have them induced so they do not drag out the calving period for another few months. This may be a benefit to farm management, but is of no benefit to the future seasonal fertility of the cows in that they will still be late calving cows and therefore be unlikely to get in calf early the following season.

The practice of inducing cows late in the season, and without undertaking early pregnancy testing should be phased out. If inductions are to be phased out, there must be a transition period for the dairy industry to ensure other reproductive management tools can be developed to enable seasonal dairy systems to continue to match the feed requirements of their herds to pasture growth. This phase out must be linked to marked improvements to the reproductive performance of the Australian dairy herd.

Australian Cattle Veterinarians has developed detailed guidelines to support the welfare of cows and calves in calving induction programs.



Australian Cattle Veterinarians

Induction of parturition guidelines

The Australian Veterinary Association has a policy on the induction of parturition which is available on the previous page and online at www.ava.com.au.

Guidelines

Any calving induction program must be structured to minimise risks to the welfare of the induced cow or her premature calf. It must involve a veterinarian with intimate knowledge of:

- the farm, the farm system and the staff responsible for the health and welfare of the animals to be induced
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- administration of compounds to induce parturition
- management and welfare of the induced cows and their premature calves
- health conditions associated with calving induction.

Detailed farm information is required before starting an induction program.

All veterinarians who are involved in inductions on farm should complete a record of the event including cow details, herd reproductive management details, and induced cow management as shown in the form in Appendix 1.

Preparatory information required before commencing an induction program

Practitioner skills

Any practitioner planning an induction program must be skilled in nutrition management, reproduction analysis and planning, body scoring and pregnancy testing (including accurate estimation of the stage of gestation). If the practitioner does not have suitable experience in these areas, then they should seek appropriate advice and assistance.

Pregnancy testing and selection of induction candidates

In order to identify all potential induction candidates, the whole herd should be pregnancy-tested at a time when cows to be induced are between 6 and 16 weeks pregnant. This will allow the optimal date for induction to be calculated, and appropriate early management of this group of cows. In some management systems, different groups of cows might need to be pregnancy-tested at different times.

Planning the induction program

It is important to ensure that cows are free from any disease and will be in the correct body score at the time of induction (4.5-5.5 on a 1-8 scale). This requires a planned nutrition program from the time pregnancy is diagnosed. The cows should be dried off, ensuring that the dry period is at least 7 weeks. It is recommended that, at drying off, cows be infused with a dry-cow antibiotic and treated with the appropriate parasiticides. Cows should also be enrolled in a vaccination program — e.g. for clostridium, leptospirosis, salmonellosis — appropriate for the farm.

Review of the farm's previous reproduction history and reproduction management plan

Calving induction should be part of a total reproduction program. Good heifer rearing and reproduction management are much more important to the success of a reproduction program than calving induction.

Before starting an induction program, the veterinarian should:

- benchmark the farm's reproductive performance — determine success and failures in previous years
- investigate the need for an induction program on the farm
- initiate a structured reproduction planning program with annual review and update

- assess whether the calving pattern is appropriate and whether there are alternative management techniques that will return equal or greater benefits to the farming operation.

Selection of candidates

A basic history of cows presented for induction should be available to the veterinarian and this should be assessed. Every cow must be pregnancy-tested prior to injection of the induction agent.

Criteria for inclusion

Age: 3–5 years old is ideal — these cows have the best performance return and are likely to remain in the herd.

Health: free from infectious disease and no history of mastitis or chronic high somatic cell counts.

Body condition: body condition score (BCS) 4.5–5.5 on a score of 1–8 (or 3–4 on a score of 1–5).

Stage of pregnancy: 27–34 weeks — it is essential that all cows are pregnancy-tested immediately before injection of the induction agent to confirm that they are still pregnant and at the correct stage.

Criteria for exclusion

Age: Greater than 8 years old.

Health: none of the following

- current health problems, particularly infectious disease
- history of significant health problems such as milk fever, mastitis, chronic pneumonia, longstanding abscess or osteomyelitis
- chronic or recurrent high somatic cell counts
- Photosensitivity,

Body condition: BCS > 6 or < 3.5 on a score of 1–8 (> 4 or < 2.5 on a score of 1–5).

Stage of pregnancy: < 27 weeks or > 34 weeks.

Parity: heifers (previously unbred females) as their use can result in extremely poor production.

Farm nutritional management: cows on farms with poor farm nutritional management, especially if there is a shortage of feed.

Administration of compounds to induce parturition

The following compounds can be used to induce parturition:

- dexamethasone trimethylacetate — currently the only product registered for this purpose
- dexamethasone sodium phosphate
- prostaglandins, including cloprostenol sodium and dinoprost trometamol.

Administration regimes and recommended timeframes

An initial injection of 25–35 mg dexamethasone trimethylacetate is given after the cow is confirmed pregnant at the correct stage. The farmer may be advised to begin milking the cows once they develop an udder. This can occur from 7 days after the dexamethasone trimethylacetate injection. Cows that calve without developing an udder should be run with the milking herd and milked to stimulate milk production. Cows that have not calved 10–14 days after the initial injection may be reassessed and injected with one of the following:

- a prostaglandin
- dexamethasone sodium phosphate
- dexamethasone trimethylacetate.

Cows that are bagged up can be given either a standard dose of prostaglandin or 25 mg dexamethasone sodium phosphate. Those that are less developed can be given either 20–25 mg dexamethasone sodium phosphate or 25 mg of dexamethasone trimethylacetate.

Cows that do not respond at all to the initial injection of induction agent should be rechecked between 14 and 28 days post-injection and may be given a second injection of 25–35 mg of dexamethasone trimethylacetate if they are confirmed as suitable candidates.

Precautions against anaphylactoid reactions

Anaphylactoid reactions after injection with a long-acting corticosteroid have been reported. All veterinarians inducing cows to calve prematurely using dexamethasone trimethylacetate should carry adrenalin for use when these reactions occur.

Recommendations for the management of the induced cows and their premature calves

Management of cows

If possible, cows to be induced should be run as a separate group after drying off, to allow for easy identification of any cows failing to meet body condition requirements. Cows should be at BCS 4.5–5.5 at drying off and be fed adequately throughout the dry period to allow for maintenance of the cow and to meet the energy requirements of the calf.

Preparatory nutrition

One to two weeks before induction, cows should be changed onto an appropriate springer ration. A balanced transition feed, controlled green pasture intake and supplementation with good quality hay to ensure a diet with a negative *dietary cation-anion difference (DCAD)* to reduce the incidence of metabolic disease are recommended. Cows should be maintained on this ration until they calve.

Prevention/management of metabolic disorders

Correct nutrition management during the dry period, particularly the 3 weeks prior to calving, and attention to body condition are the major methods for preventing metabolic disorders. Cows need to be observed regularly and the farmer must be instructed about the appropriate course of action if metabolic disease occurs or is suspected.

Management of infectious disease

Cows should be kept in a clean, well-drained, sheltered and easily accessible paddock or alternative form of confinement (e.g. calving pen, calving pad) from the time they receive their first injection to induce parturition until after they have calved. They should be kept in the best calving area available on the farm. Cows need to be regularly monitored and receive veterinary attention at the initial signs of any illness. Any delay in treatment can have serious implications for the cow and this should be stressed to the farmer.

Preparation for health and monitoring

Induced cows should be checked at least 3 times per day from the time of induction. The farmer needs to have adequate supplies and knowledge of the appropriate treatments available to prevent and treat milk fever and mastitis. Farmers should be warned that a small but variable proportion of induced cows may develop peracute infections associated with reduction in immunity caused by the corticosteroid injection. These cows may die if they are not promptly detected and submitted for veterinary examination and treatment.

Observation and assistance

Induced cows should be observed closely as they may show less obvious signs of imminent calving than non-induced cows. Many induced cows require assistance at calving. Any cow that appears to be trying to calve for more than 4 hours or is persistently straining for more than half an hour needs to be brought in and assisted as necessary.

Lactation before calving

Any cow that has a distended udder and is dripping milk prior to calving must be brought in at the beginning of each milking and milked out. These cows should not be run with the milking herd as they may not receive the appropriate nutrition (see 'Preparatory nutrition' above). Induced cows may develop milk fever before calving and are prone to being knocked down in the yard if they are in the early stages.

Management of premature calves

Assessment of vitality

Calves must not be allowed to suffer unduly. Calves should be euthanased promptly in a humane manner if they are:

- obviously nonviable
- incapacitated in any way

- unable to stand, walk or suckle within 8 hours
- more than a month premature.

Methods of euthanasia

Appropriate methods of euthanasia are:

- Injection of a euthanasia solution by intravenous or intracardiac injection by a registered veterinarian (Note: carcasses of calves killed in this way are not suitable for rendering or for use as pet food and must be disposed of by burning or deep burial)
- Captive bolt or registered firearm should be the method of choice for farmers followed by severing of the carotid arteries to ensure death. Carcasses should be disposed of quickly and hygienically in accordance with state and local government regulations.

Management of viable calves

Viable calves born within one month of their predicted due date may be reared, but will require preferential treatment if they are to survive and thrive.

Colostrum management

Calves should be fed 2 litres of good quality colostrum in the first 6 hours, followed by another 2 litres in the next 6–12 hours. It is recommended that these calves are fed colostrum for 7 days. This provides extra protection to the premature calf because of the local gut effects of antibodies against gastrointestinal bacteria. The later colostrum may be of a lesser quality than that fed during the first 24 hours, but not fermented or stored.

Colostrum quality

It is highly probable that the ability of induced calves to absorb antibodies will be compromised by their prematurity, and so colostrum quality is important. To make sure that the colostrum used is of appropriate quality, it is important to follow these rules:

Only use colostrum from animals that are healthy and disease free and have been resident on the farm for a prolonged period. Colostrum from the dam should not be used if she has been milked or has been dripping milk before calving.

Colostrum should not be sourced from heifers or other induced cows.

Only use first milking colostrum if possible.

If using unpooled colostrum, don't use colostrum from cows that are producing over 8–9 litres.

Monitor colostrum quality daily with a Brix refractometer.

Calf housing

Calves should be supplied with good housing to provide warmth and shelter and to minimise the risk of disease. Induced calves should be reared separately from non-induced calves for the first 2 weeks of life. Feed consumption and disease status must be closely monitored.

Health conditions associated with calving induction

Immune suppression

Long-acting corticosteroids (such as dexamethasone) used to induce parturition in dairy cattle impair the secretion of proteins that are critical to normal cellular and humoral immune responses, an effect that is strongly linked with changes in the composition of the white blood cells. The resulting immune suppression is still profound at the time of parturition.

Mastitis

To minimise the risk of mastitis in induced cows, practitioners recommend the following procedures:

- Ensure induced cows are treated with the appropriate dry cow therapy, with or without teatseal, prior to drying off.
- Maintain cows in clean, well-drained paddocks.
- Milk cows if the udder is tight with milk.
- Monitor udders carefully for signs of mastitis. Once the cows are being milked, strip each quarter before milking until 4 days after calving.

- Monitor induced cows very closely for signs of systemic illness. Cows may become acutely ill with a coliform mastitis endotoxaemia, even though visible changes in the udder may be limited and the secretion from the affected quarter difficult to differentiate from colostrum.

Metabolic diseases

Calving induction does not increase the incidence of metabolic diseases except in cows that are over-fat at the time of induction (refer to 'Criteria for exclusion'). Those induced cows that do develop metabolic problems may be more profoundly affected, may be less responsive to treatment and may have a higher mortality rate than other cows. Proactive steps must be taken to control milk fever in induced cows.

Retained foetal membranes

Cows induced to calve have a greater than normal incidence of retained foetal membranes. Assessment of retained foetal membranes is usually by visual appraisal, but this may underestimate the incidence. The incidence of retained foetal membranes increases with increasing prematurity and among induced cows experiencing dystocia. The drugs used for induction also affect the incidence of retained foetal membranes. Long-acting corticosteroids, when used alone, tend to produce a lower incidence than short-acting corticosteroids or prostaglandins.

Peracute infections

Induced cows are susceptible to peracute peri-parturient infections. Apart from toxic mastitis, the most common condition is peracute metritis, but cows can also suffer other severe infections such as septicaemia and enteritis.

Fertility following inductions

The reproductive performance of induced cows does not differ from their herd mates that calve naturally at the same time. The advantage in induction lies in the longer pre-mating period, allowing the early-induced cow an improved chance of pregnancy and therefore retention in the herd.

Photosensitisation

A photosensitivity reaction can occur on the non-pigmented skin and teats of induced cows. In some cases, this can be severe enough to preclude milking. It has been hypothesised that the corticosteroids used to induce parturition lead to hepatic damage, with the photosensitisation occurring as a result.

Calf mortality

Premature calves have reduced chances of survival. However, most studies (McDiarmid 1983, Bellows et al 1994, Dlamini 1995) report that when calving is induced using short-acting corticosteroids or prostaglandins within two weeks of term, little difference is seen in the number of stillbirths, calf vigour, or calf mortality compared with natural calving, except when long-acting corticosteroids have been previously used.

Calving induction should not be performed if the owner requires live calves. Approximately 50% of induced cows' calves are stillborn, die or are euthanased before they can be legally sold (at least 4 days old). The majority of induced calves weigh less than 23 kg and/or may show other signs of prematurity, also making them ineligible for sale as 'bobby calves'.

Immunity

Calves born after long-acting corticosteroid induction are lethargic, slow to stand and suck, and may not be able to take in enough colostrum during the time in which they have the ability to absorb the immunoglobulins. In addition, immunoglobulin concentration in this colostrum is reduced by the corticosteroids and may be further changed by any pre-calving milking deemed necessary. These calves also have impaired ability to absorb immunoglobulins because the steroid acts on the foetus long enough to promote premature closure of the gut absorption mechanism. Consequently, induced calves will require a higher level of management to successfully grow and avoid infectious disease. They will have a

higher morbidity and mortality than non-induced calves. Induced calves reared with non-induced calves may act as amplifiers of infectious agents such as coccidia and viral enteritis.

Growth rate

Growth rates are adversely affected by increased prematurity. Induced calves that are reared will require additional nutritional support to achieve acceptable target weights.

Other recommendations and supporting information

In an attempt to maximise the number of cows which will calve early in the season, and to reduce the need for calving induction, a number of procedures are undertaken in the majority of the seasonal (and split-calving) calving herds. These include:

1. Examination of animals prior to first insemination to detect uterine infection, and if present to treat.
2. Use of oestrus synchrony protocols to increase the numbers of animals inseminated after mating start date. Oestrus synchrony increases the number of animals likely to be inseminated in a shorter period of time.
3. Use of treatment protocols which allow cows not inseminated after a defined period (known as non-cycling cows) to commence oestrous activity and to be inseminated soon after mating start date. Research undertaken has demonstrated treatment protocols have the ability to create similar reproductive performance in treated cows as the naturally cycling portion of the dairy herd.
4. Provision of nutritional advice to maximise animal health once animals commence new lactation.

Despite these interventions, in seasonal calving dairy herds, a proportion of the herd needs to have early calving induction undertaken to maintain a seasonal calving pattern.

Undertaken correctly, the animal health outcomes of the induced cow are similar to cows calving naturally. Induction programs undertaken correctly result in few calves which are born alive. Calves born alive are humanely euthanased by dairy farmer clients as soon as they are found.

Dairy cow fertility and its contribution to the need for calving induction

Dairy cow fertility has declined on an international basis for the last 30 years. In Australia there is evidence of a similar decline in fertility since 1996. Important reasons for the decline in fertility include:

- Increased per cow milk production resulting in partition of nutrients into milk volume and away from reproduction
- An increased variation in the oestrous cycle of dairy cattle which results in decreased oestrus behaviour, and reduced precision of the timing of ovulation
- Increased farm intensity with fewer managers or skilled staff per cow
- An inherent decline in breeding values for fertility indicating that cows are genetically less fertile.

In seasonal and split-calving dairy herds the standard measurement for reproductive performance is the six week in-calf rate. This is the percentage of the herd which becomes pregnant in the first six weeks of the mating period. A second measure is the percentage of the herd empty after 21 weeks from the start of a mating period. The six week in-calf rate has declined by about 1% per year, and the 21 week not in calf rate has increased by about 0.8% per year since 1996 (Dairy Australia, 2012a). The fewer cows pregnant after six weeks will result in an increase in the number of calves born later in the calving season.

An important concept to consider in these statistics is that the dairy farmer has had little control over the decline in cow fertility. As examined in the Consultation Regulation Impact Statement: Cattle Standards and Guidelines V 1.0, 2013 the result of modern breeding practices is a dairy cow which cannot maintain a tight seasonal calving pattern without using reproductive management tools such as calving induction.

A Dairy Cow Fertility Analysis undertaken by Dairy Australia (2012b) in 2011 indicated the principal reason for the decline in reproductive performance from 2001 to 2010 has been a large decline in conception rates, and a small decline in submission rates.

There has been a decline in fertility breeding value since 1990 in Australian Holstein cows sired by artificial insemination bulls since 1990 (ADHIS 2010). There has been a steady decline in genetic breeding value for cows over the period which has only levelled in recent years since the introduction of breeding value assessments for artificial insemination sires in the Australian bull proofs reports. Recent data indicates little improvement since 2006. In 2010 fertility became a more important component in the Australian Profit Ranking of artificial insemination sires, and in 2013 a new measure for fertility was included in bulls proofs provided by ADHIS.

The heritability of fertility in cattle is considered to be low (anywhere between 3% and 7%), compared to the heritability of production indices at 30% (P Williams ADHIS pers comm). For the inherent genetic fertility of the Australian dairy herd to improve a 10-15 year period will be required to return to levels present before 1990. However, based on evidence to date, it is possible that use of genomic technology in the Australian dairy herd has the potential to increase the rate of genetic improvement for many traits (including fertility), so that improvement in fertility might increase faster than it has declined. Other research being undertaken in Australia is examining the following aspects of cow fertility:

- how nutrition might increase cow fertility, for example looking at the influence of dietary protein on cow conception patterns
- how closer examination of the genetics of fertility may improve fertility, by looking at the genes which have the most influence on fertility, and
- examining specific subgroups of the dairy herd in Australia may lead to a shift to a more fertile dairy herd (cows which produce milk with a higher protein percentage have higher six week in calf rates than cows with lower milk protein percentage).

The New Zealand Induction Code

Since 2005 routine calving induction in New Zealand for management purposes has been carried out according to industry-agreed codes. Since 2010 annual reduction targets have been in place so that from 1 June 1 2012, within an individual herd, the level of inductions should not exceed 4% of the herd's total size. Essential elements of the code include:

- cows must be identified and recorded by the veterinarian on the farm induction plan at least 60 days before the start of inductions, and only those cows on the plan be presented for induction
- cows should be no more than 12 weeks from their expected calving date, and no less than 8 weeks from their expected calving date
- any calf born alive will be euthanased humanely with a firearm or captive bolt device, and
- monitoring of induction procedures on farm as part of farm drug use audits.

For proper operation of the code it is necessary for dairy farmers to undertake pregnancy testing of their herd at the correct stage of gestation and for animals to have a permanent form of identification. Other guidelines apply to cow selection, cow age, cow disease status and body condition, cow and calf management.

It could be argued that the dairy industry in Australia should immediately adopt a similar reduction in the level of calving induction as the New Zealand dairy industry. However, there are several differences between the dairy industries of the two countries which require the dairy industry in Australia to develop its own strategy. These differences include:

- the inherent superior fertility of the New Zealand dairy herd. The average 6 week in-calf rate in Australia is 50% in seasonal calving dairy herds. In New Zealand this rate is 66%.
- New Zealand has a target to achieve a national 6 week in-calf rate of 78% by about the year 2020. Australia has a target to achieve a 5% increase (from 50 to 55%) by 2017.
- The issue of the need to reduce calving induction has been addressed since the early 2000's in New Zealand and therefore has collected a large amount of industry commitment to achieve targeted reductions. As the number of dairy cattle that are induced in the Australian industry has been traditionally low (2-4%), the issue has

received less attention by the industry, as there have been programs implemented by the industry that have achieved greater animal welfare outcomes than a reduction in calving induction. Such programs include programs to reduce mastitis, lameness, calf health, and programs to improve the nutritional management of dairy cattle.

There have been significant implications for the new target for inductions in New Zealand. In many herds the cow wastage rate has increased significantly, as cows not fitting into a calving pattern, and which exceed the threshold for induction levels are culled prematurely from herds. Rates of culling of 20% or more are not uncommon in New Zealand (M Bryan, pers.comm), a rate which has implications in itself for animal welfare. At this rate of culling less opportunity exists to selectively remove animals from herds which suffer conditions having welfare implications such as mastitis and lameness.

However, if the industry in New Zealand achieves its stated target of a 78% 6 week in-calf rate, the issue of calving induction will be reduced, as very few animals will be required to be induced so that they calve within the herd's calving pattern.

Adoption and vigorous promotion of farmer extension programs on integrated reproductive management is recommended. These programs should include education about available procedures and protocols, costs, benefits and welfare considerations.

Ongoing research is required to develop reproductive technologies and reproductive management programs that can be used on farm. Research into the economics of changing the calving pattern is also required.

Conclusion

The immediate banning of calving induction will result in increased animal welfare concerns in seasonal calving dairy herds in Australia. A ban has the potential to reduce farm viability due to lower milk income and higher costs associated. Lower farm viability has the potential to reduce animal welfare in affected herds. A ban also has the potential to disrupt the viability of the milk processing sector by changing the milk flow characteristics in dairying regions where calving induction is practiced. For an orderly transition from the current situation to a situation where no calving induction is undertaken, a phased strategy needs to be implemented.

Properly undertaken, calving induction programs developed with veterinary supervision result in few animal welfare issues for cows and calves.

A Code of Practice for calving induction needs to be developed between Dairy Australia, Australian Cattle Veterinarians, Australian Veterinary Association for implementation in 2014. The code will be based on the Operational Guidelines: Induction of Calving June 1, 2012 developed in New Zealand.

Appendix 1 - Veterinary Record of Farm Induction

Farm Name

Address

Herd Size

Calving Start Date

Farm Reproductive Management Strategy

Induction Dates

Number to be induced including ID and date of potential induction

BCS of Induced cows (1-8 scale) Average Range

Stage of Gestation of Induction Group

Health Status

Vaccination Status

Previous Dry Cow Therapy (Teatseal) History

Dry off Date

Transition Feeding Management

Induced Calf Management Strategy

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