THE MANAGEMENT OF DYSTOCIA IN CATTLE

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Introduction

Dystocia is the term used to describe difficult birth. There has been an awareness of dystocia and its impact on cattle health for thousands of years. There is even an Egyptian pyramid image depicting the assisted delivery of a calf by traction. Yet, despite there being an awareness of the problem of dystocia for such a long time, it still causes significant economic loss to both the beef and dairy industries. As an example, estimates of the loss dystocia causes to the national beef herd range from $30 million to $200 million annually. Taking even the most conservative of these figures represents a huge annual loss to the industry.

In both beef and dairy cattle production, dystocia most commonly occurs in heifers. Common estimates of dystocia in British breed beef heifers fall in the range of 10% to 40% with an average of approximately 20%. Dystocia is also reported to be the primary cause of calf loss in two-year-old beef heifers. In contrast, in older breeders dystocia is generally insignificant with estimates ranging from 0.8% to 3%. This figure may be slightly higher in dairy cattle due to the metabolic pressures placed on calcium stores and the important influence calcium has on uterine contraction. Statistics on dystocia prevalence are hard to come by for cattle in northern Australia, but anecdote suggests that although dystocia may not have been considered a significant problem in the past, either the prevalence may be increasing, or better surveillance techniques may now be accurately documenting the high number of cases that are occurring.

As an industry, we have some good management tools to reduce the prevalence of dystocia, and some feel that it is just a matter of putting current knowledge into practice to effectively reduce the problem. However, the science does not yet back up this assumption and it is apparent there is still a large deficit in our understanding of the causes of dystocia. The current science tells us that only 63% of the causes of dystocia are known. This means we still have to identify the remaining 37% of causes.

This article explores our current knowledge on the causes of dystocia in heifers followed by a description of management techniques that can be used to reduce its occurrence.

Causes of Dystocia

Not a great deal has changed in the last 30 years or so regarding our understanding and classification of the general causes of dystocia in cattle.

In decreasing order of occurrence the three most important general causes of dystocia in beef cattle are considered to be:

1. Calf too big to fit through the pelvis of the heifer
2. Calf coming out backwards
3. Ineffective labour (weak labour)

These three causes of dystocia are reported to account for 30-70%, 20-45% and 10-20% of dystocia in beef heifers respectively.
Although it is convenient and traditional to classify the causes of dystocia in this way, these broad classifications don’t allow specific control measures to be implemented. For example, “calf too big to fit through pelvis” simply suggests an incompatibility between the size of the fetus and the size of the cow’s pelvis. The reason for the incompatibility could be one, or a combination of many factors. Specific control measures can only be implemented once specific causes have been identified. In heifers, these specific causes are usually associated with physical traits of the heifer or calf, hormonal function in the heifer, or metabolism of the heifer.

A study in southern Queensland identified the following seven physical traits that adversely influence dystocia in beef heifers:

2. Male calves.
4. Lower pelvic area of heifers at 12 months of age.
5. Lower ratio of pelvic area of heifers at 12 months of age to calf birth weight.
6. Higher heifer body condition score at calving.
7. Heavier placental weights at calving.

In the same study, two environmental factors were identified as adversely influencing dystocia. These were:

1. Lower rainfall during the second trimester of gestation for heifers bred to calve as two-year-olds.
2. A later calving date for heifers calving as two-year-olds.

Ineffective labour describes calving difficulty which is not attributable to high calf birth weight. It is also known as “physiological dystocia”. This type of dystocia is associated with abnormal pre-calving hormone production and associated poor contraction of the uterus. There may also be the confounding effect of low blood calcium at the time of calving. Placental preparations from cows experiencing ineffective labour and requiring obstetrical assistance have demonstrated abnormal hormone metabolism in the placenta. This is an important point. Firstly, it is clear that the placenta plays a very significant role in controlling the hormonal events surrounding calving. Secondly, because the fetal side of the placenta (the fetal membranes) develop from the fetus, it is likely that there will be a significant genetic influence from the bull on placental function. This means that weak labour in the heifer may not necessarily be the sole fault of the female; the genetics of the bull may need to be included in any investigation into high dystocia prevalence. In addition, deficiencies of calcium, phosphorus, copper, cobalt, selenium, iodine, sodium, zinc, magnesium and manganese have all been implicated as causes of dystocia due to ineffective labour. In particular, zinc deficiency can impair hormone responses. So it is also possible that low blood zinc concentrations may be involved at this level.

From a dystocia control point-of-view, it is important that a clear distinction be made between dystocia due to a large calf and dystocia due to ineffective labour. This is because different types of dystocia require different approaches to management.

Some of the specific causes mentioned above, such as high birth weight calves, have been known for many years. Yet others, while intuitive, have only recently been identified and may require further trials to become unequivocal.

To further complicate effective dystocia management, there are many underlying factors that can influence how specific causes of dystocia manifest themselves. These factors can be
classified in a number of ways, however it is common to divide them into the following seven categories.

1. Hereditary
2. Nutritional
3. Managerial
4. Environmental
5. Infectious
6. Traumatic
7. Miscellaneous
8. Combined

Identifying the Problem

Dystocia management is easier if the specific physical traits, environmental or managerial situations that influence its prevalence are identified. Steps that can be taken to achieve a specific diagnosis include weighing replacement heifers at intervals from weaning to calving as two-year-olds, measuring yearling heifer pelvic areas, weighing calves at birth, recording calf birth dates, monitoring and recording pasture quality and quantity, monitoring and recording daily rainfall figures, collecting suitable samples to assess trace element status and recording comments for all assisted calvings. With this information, prospective and retrospective assessments can be made.

Investigations of mineral deficiency in herds experiencing dystocia associated with ineffective labour should start by analysing 10 blood samples from heifers in late pregnancy. Although sometimes difficult to time, ideally the blood should be collected within two weeks prior to parturition, or in the case of dystocia, at parturition. The use of blood samples after calving may overestimate prepartum mineral levels. Blood collection and mineral analysis can be organised through your veterinarian.

The Management of Dystocia in Beef Cattle

There have been many general suggestions for reducing the impact of dystocia. Ideas include: changing to a breed with lower dystocia prevalence, increasing surveillance of heifers during calving, not calving until after the heifer is older than two years of age, manipulating nutrition at different stages of heifer development and manipulating calf birth weight by careful bull selection. Most of these suggestions were derived from studies performed close to 30 years ago and there is still debate and confusion as to the effects of nutrition, season, age of heifer at breeding and pelvic area on the incidence of dystocia. Of all the parameters studied and reported, high calf birth weight and male calves are the only ones that appear to be unequivocally linked with increased dystocia prevalence. With this in mind, one of the best steps towards dystocia control is careful bull selection to reduce calf birth weight. However, there are many techniques that have been used in an attempt to decrease the prevalence or impact of dystocia in beef herds. Some are more effective than others. These are summarised below.

Objective bull selection

Lowering calf birth weight is one means of reducing the incidence of dystocia that is unchallenged. With regard to selecting bulls that are to be bred to heifers, the aim is to minimise calf birth weight without dramatically reducing postpartum growth. This is easier said than done, but Group Breedplan (using estimated breeding values) can help. Even if some postpartum growth is sacrificed, the production of a live calf and live heifer with
minimal surveillance input is a beneficial outcome. In the future, the use of gene markers will most likely help to dissociate desirable traits such as low birthweight calves, from undesirable traits such as low postpartum growth rates.

Limited work has been done to determine the influence of measuring pelvic area in bulls on the incidence of dystocia in heifers. Although more research is necessary, there appears to be the potential to select bulls that will produce heifers with larger pelvises. If bull pelvic areas are measured, the aim is be to breed bulls with larger pelvic areas to the main cow herd so that heifer progeny with increased pelvic area can be selected as replacements.

**The use of half-sib or “littermate” sires**

Littermate bulls are half-brothers to the heifers they are bred to. This is so-called “contemporary genetics” or “anti-hybrid vigour”. Regardless of the colourful terminology, it is a form of in-breeding that produces smaller calves. In commercial herds this technique appears to have given consistent reductions in the prevalence of dystocia in heifers. Heifers are joined to bulls that were born in the same calf crop. In this sort of programme it is essential that bulls selected be from an unassisted birth and of average birth weight for the crop. This method of control is considered a “quick fix” only for commercial herds.

**Jersey Bulls**

The use of Jersey bulls over heifers results in very few dystocias, but is also a “quick fix” for a problem commercial herd and is not recommended as a long-term answer.

**Visual Appraisal**

Producers commonly use visual selection of bulls based on shoulder and pelvis conformation. It has been suggested shoulders that slope in towards the backbone are a desirable trait in bulls to be bred to heifers. This may help to produce calves with relatively narrow shoulders that pass more readily through the maternal pelvis. Comment from field days and producer meetings suggest many producers practice the use of visual selection of heifers to identify those with a large frame or pelvic structure. Unfortunately there is no scientific evidence to support the effectiveness of this procedure in reducing calving difficulty. To the contrary, it has been shown that external measures of the pelvis do not necessarily reflect the all important internal measurements of the pelvis.

**The use of Crossbred Heifers**

A large amount of research has been carried out to compare the prevalence of dystocia between purebred cattle breeds and crossbred animals. Some of these studies refer to “specific combining abilities”, which describe the likelihood of dystocia from specific crosses, for example a Brahman dam crossed with a Hereford sire. In contrast “general combining ability” describes the overall performance of, for example, Hereford dams crossed with any other sire type.

From this research it is evident that:

1. Calf birth weight can be significantly controlled by the dam. In this regard, dystocia incidence is generally low in Brahman cows even when bred to bulls of different breeds. This indicates that they have a general combining ability that results in reduced dystocia.
2. Heterosis (hybrid vigour) affects heifer pelvic area, with Brahman crossbred heifers having increased pelvic areas compared to purebred contemporaries. This may reduce dystocia incidence in crossbred heifers.

3. Heterosis affects calf birth weight. Brahman sired crossbred calves can have large birth weights due to the hybrid vigour associated with Bos indicus x Bos taurus and the relative inability of Bos taurus dams to control calf growth compared to Bos indicus dams (see point 1 above).

The important aspect of these last two points is that the heifer should be the cross-bred animal and hence benefit from any heterosis. This is in contrast to the calf being the cross-bred, where there is potential that heterosis will lead to increased birth weights.

Heifer Management from Weaning to Breeding

It could be argued that management of the heifer during the weaning to breeding period has one of the most profound effects on subsequent calving ability as a two-year-old. Evidence that calving difficulty in beef heifers can be influenced by energy intake and growth rates of the heifers between weaning and breeding has been available for at least 20 years. One study reported a 24% increase in the proportion of heifers on a low energy diet between weaning and breeding requiring calving assistance compared to those on a high-energy diet. Despite this knowledge, there is little information on practical methods of incorporating it into management procedures for reducing heifer dystocia.

In a recent study, there is evidence to suggest that British breed beef heifers should reach approximately 280 kg as yearlings in order to have greater than an 80% chance of an unassisted calving as a two-year-old. A consequence of heifers being 280 kg or more at 12 months of age is that they will be approximately 320 kg three months later at joining, assuming a growth rate of 0.5 kg per day. This is approximately 40kg or 14% heavier than the current critical mating weight recommendations for British breed beef heifers.

Target Weights (Critical Mating Weights)

The use of target weights, or critical mating weights, for heifer selection prior to breeding have been recommended for approximately 30 years. These weights give an indication of heifer maturity. They indicate when heifers are cycling, mature enough to breed and will give acceptable conception rates in a restricted breeding period. As discussed above, there is some evidence to suggest that from a dystocia point-of-view current recommendations may be on the light side. This was discussed in more detail under the heading of heifer management from weaning to breeding.

Pelvic Area Measurements

The use of pelvimetry in both heifers and bulls is a controversial method used to control dystocia. The controversy arises from concerns about the repeatability of the measurements using the current tools. In general, there is little doubt that the use of a precise pelvic area measurement is useful for assisting with heifer selection and the reduction of dystocia. A recent study in southeastern Queensland confirmed previous reports that heifers requiring assistance at calving as two-year-olds had significantly smaller pelvic areas as yearlings. It also confirmed that heifers requiring assistance had smaller pelvic area : calf birth weight ratios. Both of these findings confirm the value of increasing the pelvic area of yearling heifers in the management of dystocia. The apparent imprecision in measuring pelvic area suggests that the technique is currently more suited to group selection methods in contrast to attempting to identify individual heifers that may require assistance at calving. This involves
culling a percentage of heifers with lower pelvic areas. The use of pelvimetry for heifer selection will increase in value when a more precise tool is developed for its measurement.

**Use a Restricted Breeding Season**

The benefits of a restricted breeding season are well documented. It results in a defined calving period compared to enterprises where bulls are left in all year. With respect to dystocia, this allows more efficient surveillance of heifers at calving and provides a calf crop of similar age to make quantitative selection of future heifers more equitable. Management of nutrition for the replacement heifers is also more efficient.

**Nutrition During Gestation**

Studies on the effects of nutrition during gestation have usually focussed on manipulating feed intake during the last trimester of pregnancy. Restricted precalving nutrition limits calf birth weight, however heifers on a low plane of nutrition in late pregnancy may put less effort into the parturition process and calf survival is often reduced. It seems that except for extremes, attempts to reduce dystocia by manipulating nutrition during late pregnancy, in isolation from the rest of gestation, almost always fail.

The summary of more recent research is that for the whole gestation period, heifers exposed to above average nutrition in the first two trimesters followed by below average nutrition in the third trimester had low calf birth weights and required minimal calving assistance. This was in contrast to heifers exposed to below average nutrition in the second trimester followed by above average nutrition in the third trimester that required high levels of calving assistance. In short, heifers exposed to low second trimester nutrition experienced high levels of calving difficulty.

In specific reference to the dairy situation the feeding of monensin during the dry period (third trimester) increased the risk of dystocia by 2.1 times.

It seems that the ideal situation is steady growth throughout gestation in the vicinity of 0.5 to 0.75 kg/day. The use of growth promotants in late gestation is not considered desirable. Net growth of the heifer should be considered in the last trimester, taking into account that the conceptus is putting on 0.2 to 0.3 kg/day at this stage.

**The Use of Mineral/Trace Element Supplements**

There is a lack of information in the literature on the effect of dietary mineral and trace element concentrations in the diet on the occurrence of dystocia in beef heifers. Deficiencies of calcium, phosphorus, copper, cobalt, selenium, iodine, sodium, zinc, magnesium and manganese have been identified as possibly causing increases in the duration of parturition. The correction of these multiple mineral deficiencies has been attempted using a precalving mineral supplement containing 15% magnesium, 4500 ppm copper, 600 ppm iodine, 100 ppm cobalt, 50 ppm selenium with the addition of unspecified amounts of sodium, phosphorus, zinc, manganese and vitamins A, D3 and E. In practice, the use of this mix has solved the problem in some cases, but a substantial number fail to be corrected. This is probably more to do with the difficulty in accurately diagnosing the specific cause of the dystocia.

**Body Condition at Calving**

There is evidence of dystocia resulting from ‘ineffective labour’ being due to beef heifers that are overfat at the time of calving. This concurs with the common management plan of not
having heifers too fat at calving and supports the idea of including mechanisms for increasing heifer exercise in the dystocia control programme.

**Increasing Heifer Exercise**

Providing exercise to heifers by forcing them to walk to water has been recommended. Anecdotal evidence suggests this is a method of preventing heifers from becoming too fat during late gestation. The technique has been widely advocated throughout the industry and intuitively has merit, but currently there is only indirect scientific evidence to support its use.

**The Time of Calving**

The effect of ambient temperature during late gestation on calf birthweight has produced conclusive results. Friesian calves born during the hot summer months have lower birth weights compared to calves born in the cool winter months. Heifers calving during winter in North America are reported to experience increased dystocia compared to heifers calving during the warmer months. More recent research involving British Breed beef heifers in Nebraska supports the suggestion that cooler temperatures during the last trimester of gestation result in calves with higher birth weights. Mean calf birth weights can be almost 5 kg lighter with a 6.1°C increase in mean air temperature during the last trimester of gestation compared to heifers calving after a cooler last trimester.

Other factors that may influence the calving time include expected rainfall and pasture conditions. This was discussed previously under the heading of ‘Nutrition during gestation’.

The fact that higher prevalences of dystocia have been noted in heifers calving later in the calving period, may also be related to natural variations in gestation length. This would occur regardless of when the calving season was scheduled. In the stud situation, accurate records of gestation length, associated with active selection may help to reduced the occurrence of extended gestation lengths.

**Calving Induction**

Calving induction programmes using corticosteroids and prostaglandins have been used with mixed results. The aim is to induce calving early in order to deprive the calf of extra time to grow in-utero. With the fetus growing at approximately 100g/day during late gestation, calving would have to be induced approximately 10 days early to reduce calf birth weight by one kilogram. The problem is that calves born more than two weeks prior to their estimated calving date have a poor prognosis for survival in extensive management situations. Problems with retained fetal membranes and the uncertainty of breeding dates make this an awkward and risky method of dystocia control. Induction could also possibly result in increased dystocia if used incorrectly in situations where ineffective labour was a major problem. The main advantage of calving induction programmes is the ability to provide targeted supervision of the animals.

**Gestation Length**

Gestation length is known to have an influence on dystocia prevalence, but the mechanisms leading to dystocia are different for gestation periods longer or shorter than those considered normal. Gestation periods longer than 280 days can result in progressively increased calving difficulty primarily as a result of increased calf birth weight. Gestation periods shorter than 267 days have also been found to increase calving difficulty perhaps as a result of an hormonal environment that is not optimal for reproductive tract preparation prior to parturition. The prepartum hormonal environment depends heavily on the normal
development of the fetus and placenta. The length of gestation has been found to be heritable and so could be changed by selection. Bulls can be selected with EBV’s for shorter than average gestation lengths, which is a suitable thing to do if heavy calves are the main cause of dystocia.

**Increased Surveillance of Heifers at Calving**

Although this technique doesn’t reduce the prevalence of dystocia, it can reduce the impact by controlling losses. This is one area where calving induction may have a useful role as it can help calving time to be known. This is also a good reason to have a restricted breeding season.

**The Future**

Already, gene technology is allowing the early identification of genes and traits associated with dystocia. The practical application of this will most likely mean that in the near future, a sample of blood or tail hair will allow the accurate identification of individuals with the required traits to reduce dystocia.