local anesthesia in combination with analgesia in the form of an non-steroidal anti-inflammatory drug appears to be the most effective method of pain relief, however there are practical limitations to providing pain relief on farm including the necessity of handling animals twice, needing a veterinarian to administer the drugs, as well as the financial cost. Therefore, it is important to develop methods of providing pain relief that effectively reduce the pain-induced distress caused by these procedures and are practical for farmers to use. At least until, alternatives to performing these painful husbandry procedures are currently available and/or practical to implement. However, at some point, pressure may be placed on farmers to stop performing these procedures regardless of the availability of alternative methods of pain relief. Therefore it is also important to focus on strategies that farmers could implement that would prevent the necessity to perform these painful procedures, not only for the welfare of the animals, but also to achieve positive public perception of farming in New Zealand domestically and internationally.

The welfare implications of dystocia in sheep and cattle

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ABSTRACT

Dystocia occurs when birth does not proceed effectively and the foetus is either not born or is born after delayed birthing. If the foetus is not born and assistance is not given to make this happen then the foetus will die and so usually will the dam. Dystocia is considered painful. Dairy farmers ranked it below lameness, feeding, disease and weather as a welfare issue. In New Zealand dystocia is reported as affecting 6.5% of cows and 3.8% of heifers but figures of 15% and 10% are also quoted. Dystocia in ewes is also variable. In one survey, farmers reported assisting 7% of yearlings at birth. The availability and usefulness of human assistance during dystocia depends on many factors, but the increase in herd size may result in less attention being paid to individual cows at calving. The increase in flock size and fecundity probably has mixed effects on lambing management. Ewes scanned as triplet bearing receive more attention at lambing than single bearing ewes as farmers attempt to maximise lamb survival. The lack of attention to dystocia is a significant welfare issue due to the immediate pain involved but also the long term suffering as the dam dies from infection over a number of days.

Keywords: dystocia; fecundity; ewe; lamb; cow; heifer; welfare.

INTRODUCTION

The birth of a live healthy lamb or calf is the beginning of a cycle through neonatal survival, growth and either slaughter for meat or retention for breeding. The value of a young animal to the farmer differs depending on many factors including farm size and the farming system. A live healthy calf is probably of more significance to a cow/calf beef farmer than to a dairy farmer and while lambs are fundamental to profitability on a sheep farm, calves are not so economically significant on a dairy farm. The value of the individual cow or ewe to an enterprise depends on the size of the herd or flock and Mee (2008) mentions the lack of attention to individual cows, or "loser cow syndrome", in large dairy units. As the birth and survival of lambs or beef calves are basic to the profitability of ewe and beef cow systems, management practices have developed to maximise the success of this part of the production cycle. Lambs and calves are born when the weather is appropriate and when grass is becoming available to support lactation. Available shelter and farm topography best suited to minimise losses due to mishap and exposure are used to maximise survival. Ewes may be shorn mid to late gestation to facilitate lambing and encourage shelter-seeking behaviour (Lynch & Alexander, 1977). Scanning to identify ewes with one, two or three lambs allows nutrition to be adjusted during gestation to suit the different uterine loads.

Sheep farmers, faced with poor wool and lamb prices have struggled to survive financially by increasing their flock sizes, lamb crops and carcass weights. In New Zealand, while the national flock is decreasing, the average flock size has increased

from 3,424 sheep in 1985 to 4,340 sheep in 2007 and lambing % has increased from 100% in 1990 to nearly 130% in 2008. Beef cow numbers are declining (Meat and Wool New Zealand, 2008a) whilst dairy cow numbers continue to rise as do the number of cows per herd, 144 cows in 1984 and 322 cows in 2007, while dairy herd numbers have decreased from 15,881 in 1984 to 11,630 in 2007 (Livestock Improvement Corporation, 2008b). Larger flocks and herds generally result in a lower human to stock unit ratio and less time to spend with each animal hence the concept of the "loser cow syndrome" mentioned above. A reduction in time means less time to observe animals around parturition and to deal with birth and post-parturient problems. When combined with increased fecundity in the ewe flock, breeding ewe lambs, larger beef calves, and breeding 15 month old beef heifers, this can have poor consequences for dams and their offspring. This paper will look at the welfare issues of dystocia in sheep and cattle.

DYSTOCIA

Welfare significance

The welfare significance of birth can be related to the experience of the dam and the offspring. Birth from the dam's perspective is probably a painful experience, the pain reduced to some degree by the analgesic effects of the hormonal state of the animal giving birth and the analgesic effect of placental fluids (Aurich *et al*., 1990; Cook, 2002; Machado *et al*., 1997). When birth progresses naturally, the significance of the pain may be ignored as part of the natural reality of birth *per se*. When dystocia occurs, the significance of the pain and distress experienced by the animal giving birth is increased and unless the birth either eventually progresses to completion or the animal is assisted, death will probably occur after some days of suffering. In New Zealand, veterinarians consider dystocia in the cow, due to feto-maternal disproportion requiring traction alone, to be painful, ranking 7 on a scale of 1 (No pain) to 10 (Severe pain) and just below dehorning at 8 (Laven *et al*., 2009). They ranked the pain experienced by calves after dystocia as 4 out of 10. In the United Kingdom, 66% and 39% of veterinarians administered a non-steroidal anti-inflammatory drug to cows and calves respectively after dystocia to reduce inflammation and pain (Huxley & Whay, 2006).

Severity of dystocia

The severity of dystocia has been graded in many ways. In Ireland, a four point scale is used for cows, 1 = no assistance, 2 = some assistance, 3 = considerable assistance and 4 = veterinary assistance (Mee, 2008). Dystocia may be partial in that birth eventually occurs or total in that birth will not occur unless assistance is given. The incidence of dystocia varies between species, breeds and types. In dairy herds, dystocia levels range from 2% to 7%; in New Zealand Holstein Friesians, calving difficulties are seen in 6.5% and 3.8% of heifers and heifers + cows respectively (Mee, 2008). Holmes *et al*. (2007) quote figures of 15% and 10% for heifers and cows respectively. New Zealand beef farmers assisted 7% and 1.7% of two and three-year-old primiparous heifers respectively (Hickson *et al*., 2008).

TABLE 1: Causes of dystocia (Mee, 2008).

Type	Cause
Proximal	Feto-pelvic disproportion, abnormal foetal position, uterine inertia, uterine tortion, vulval or cervical stenosis.
Intermediate	Gestation length, fetal oversize, birth canal undersize, hypocalcaemia, hypomagnesaemia, stress.
Ultimate	Foetal sex, multiple foetuses, foetal abnormalities, sire and dam breed, previous dystocia, age, season, nutrition, exercise, disease, herd size, region.

Dystocia in ewes is variable. In New Zealand, farmers reported that they assisted 7% of yearlings at lambing, 4% required to be mothered up with their lambs and 2% died during lambing (Kenyon *et al*., 2004). West *et al*. (2009) reported that in some flocks overseas, up to 50% of ewes were assisted at birth. Assistance of itself may be a minor activity involving a little traction or it may include severe traction, repositioning of the foetus, fetotomy or in an extreme case caesarean section.

Components of dystocia

There are three main components to dystocia, expulsive forces, birth canal capability, and foetal size and position. The cause of dystocia (Table 1) will impact on treatment and outcome but whether assistance is given will depend on the management system. In extensive lambing systems, interference with individual ewes and the disturbance of the flock which occurs during this process is perceived to increase the incidence of dystocia, so having free lambing ewes is an imperative from a welfare and an economic perspective (Fisher, 2003). In intensive birthing systems with frequent observation of the pre-parturient animals, such as is seen on dairy farms, indoor lambing or often with triplet bearing flocks, dystocia can easily be observed and attended to quickly. In these situations, the welfare significance of dystocia, for both dam and offspring, depends on the type of dystocia and the ability of the stockperson to alleviate it or get veterinary help.

Treatment of dystocia

The treatment of dystocia requires effective capture and restraint of the affected animal. Adequate lubrication and gentle traction is often all that is required to effect birth. This may be distressing and painful for the affected ewe or cow, but if a live lamb or calf is born, this is usually forgotten as the dam attends to her offspring. Some forms of dystocia require veterinary assistance and if this is not possible for logistical, economic or temporary reasons, and if birth cannot occur then the affected animal should be killed. Veterinary assistance and procedures such as caesarean section are generally uneconomic in ewes at least in New Zealand and may be also uneconomic in some beef or dairy cows. The cost of a caesarean section in a dairy cow may end up being $400 to $500. Many sheep and beef farms are in remote localities and it is often best to kill affected animals that cannot be treated effectively. There are no clear guidelines about when this should be done.

Survival of lambs associated with dystocia

The pain of birth and that caused by repositioning of foetuses and traction is poorly understood but many veterinarians now give cows a non-steroidal anti-inflammatory drug after assisted births to reduce inflammation and pain. The distress experienced by the ewe when lambing does not progress has not been quantified but the increased activity around the birth site seen initially and the eventual depression, caused by toxaemia as the lamb dies and becomes rotten, suggest that the animal is suffering. Human empathy and intuition supports this suggestion. The foetus may not be conscious of this experience as it will have low arterial oxygen tensions which do not support consciousness. Thus it may not suffer during dystocia (Mellor & Stafford, 2004).

Cows that have experienced dystocia and have been assisted to calve are more likely to have retained placenta, uterine infections, mastitis and may have dystocia subsequently (Mee, 2008). The live calves born after assistance are more likely to become sick than calves born without assistance; for example Friesian calves assisted at birth had lower blood packed cell volumes and took, on average, 96 minutes to stand whereas unassisted calves took, on average, 53 minutes to stand (Diesch *et al*., 2004). The financial costs of dystocia in dairy cows are primarily production, fertility and morbidity/mortality related in descending order (Mee, 2008). In sheep, ewes die because of dystocia even if assisted. In one study (Kerslake *et al.,* 2005) about 50% of the dead lambs were thought to have died from dystocia. This may be an overestimation but it does indicate the significance of dystocia as a cause of lamb mortality. Moreover, lambs that survive dystocia may or may not feed and if they do, may live for some days before succumbing to starvation or exposure. Such lambs that survive are certainly conscious and suffer for some period of time before succumbing.

To maximise chances of survival, a lamb needs to be born easily, be of an optimum size at birth, bond effectively with the ewe and receive sufficient milk from her, and be sheltered from severe weather conditions. As the lambing % increases above 180%, the number of triplets born increases while single lamb numbers decrease. This is associated with a reduction in average birth weight and an increase in lamb mortality. It is generally accepted that in a litter of three lambs, one dies. In a number of studies, single lamb survival varied between 83 and 90%, twins 80 to 94% and triplets 59 to 78% (West et al., 2009). Single lambs are more likely to die due to dystocia than twins or triplets due to their relative large size (Kerslake et al., 2005). However, at birth, triplet lambs have poorer probability of survival than single or twin lambs as they are lighter, have a lower blood packed cell volume, plasma fructose and thyroxine, a lower rectal temperature and higher plasma lactate than the latter. Moreover, within a set of triplets, the lighter triplet is less able to survive as they have higher lactate than the heaviest triplet (Stafford et al., 2007). In New Zealand Romneys, the lightest triplets are on average 600 grams lighter that the middle weight and 1.1 kg lighter than the heaviest (Kerslake et al., 2010). At birth and one hour of life, the lightest triplet has a lower rectal temperature than the heaviest one. The mortality rate of triplets varies according to their relative size; lightest 56%, middle 40%, heaviest 28% (Morel et al., 2008). Mortality depended not on birth weight but on the lamb weight as a % of the total litter weight; the higher the % the lower the mortality. In one study, 48% of triplets die because of dystocia and 27% died of exposure/starvation (Kerslake et al., 2005). Twin and first born triplet lambs that did not survive to three weeks of age took at least twice as long to be born as those that survived (Everett-Hincks *et al*., 2007). Thirty percent of lambs that died before three days of age had not breathed (Kerslake *et al*., 2005) and therefore had probably not become conscious. Of the remaining 70%, 23% had not walked. The level and duration of consciousness of these lambs is unknown but some may not have been conscious for long. Of the remaining animals that had breathed and walked 55% had not fed.

Moral issues associated with dystocia

The mortality rate of lambs creates a dilemma because in extensive sheep farming with large ewe flocks lambing outdoors, there is not the possibility to engage in many of the practices used in more

intensive systems. These include observing and managing the birth process, switching or fostering lambs, or confining the ewe and her lambs until a good bond develops and the lambs are strong. In extensive systems, pregnancy scanning can indentify single, twin and triplet bearing ewes and thereafter these ewes can be managed nutritionally to minimise the risk of dystocia in single lambs, and triplets and twin ewes can be lambed in specially selected paddocks with shelter and feed. A survey of farmers with a mean weaning percentage of 143% found that they did two to three lambing beats a day (Everett-Hincks *et al*., 2001), which supports the view that lambing management is a major issue with farmers with high production figures. Lambing beats allow farmers to identify cast ewes, ewes with prolapsed cervix or "bearing", and ewes with dystocia. If ewes remain settled during lambing beats and the capture of affected ewes can be effected without major flock disturbance, then the treatment of individual ewes is probably worthwhile. If flock disturbance is significant, then ewes with protracted dystocia or prolapsed cervix should probably be shot from a distance rather than disturb the whole flock by attempting to catch the affected individual.

Dystocia will always be an issue for sheep, beef and dairy farmers. Remote monitoring of cows in large dairy herds may make the management of birth and dystocia easier. In large sheep flocks, scanning allows the identification of triplet, twin bearing and single bearing ewes. This facilitates differential feeding and makes increased observation of triplet and twin bearing ewes worthwhile and may allow for assistance during dystocia.

CONCLUSION

The welfare issues pertaining to dystocia are well understood by farmers who try to minimise the distress experienced by animals during difficult births. However, the actual pain and distress experienced by ewes and cows during birth and dystocia have not been studied, probably due to the difficulties of developing useful protocols for such research. A better understanding of the development of pain and distress during birth and dystocia would make it easier to identify when to interfere and when to kill affected animals. This is a standard example of attempting to respond to an animal welfare issue before it becomes a public concern.

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