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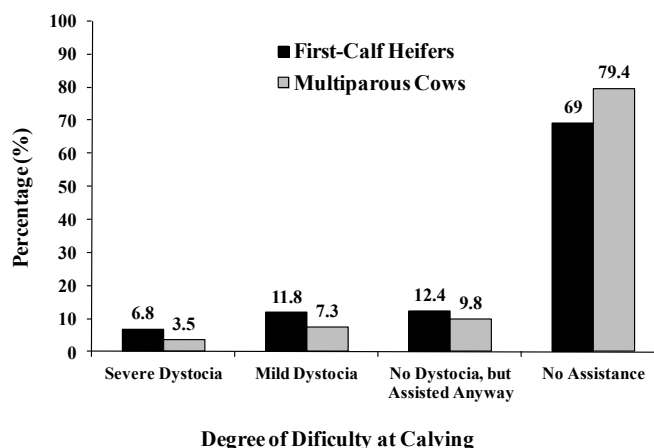
Calving Management in Dairy Herds: Timing of Intervention and Stillbirth

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Introduction

Dystocia has been defined as a difficult birth resulting in prolonged calving or severe assisted extraction of the calf at birth.^{1,2} When referring to problems at calving, it is important to note the difference between *dystocia* and *assisted birth*. Assisted birth is defined as a birth in which assistance is required (e.g., only one foot of the calf is visible outside the vulva), but this may not necessarily result in dystocia.¹ In practice, as soon as the malpositions are corrected, the cow may complete the delivery normally or with minimal assistance. Dystocia increases the incidence of stillbirth and calf mortality within 30 days postcalving.^{1,2,3,4} In addition, dystocia increases the likelihood of trauma on the dam (i.e., paresis), uterine disorders, and decreased milk yield.^{5,6} The incidence of dystocia (assistance required during parturition) varies between studies, but it is generally higher in primiparous cows compared with multiparous cows in the US (Figure 1).^{1,7,8}

Figure 1. Distribution of dystocia according to the degree of assistance provided during parturition in first calving heifer and multiparous Holstein dairy cows in the US.⁸



The degree of assistance (force) that is provided during assisted parturition determines the degree of dystocia (difficulty of birth). Several scales have been described to determine the degree of assistance provided during parturition (Table 1).

Comprehensive training on calving management for dairy personnel has been reported as a top priority to mitigate the negative effects of dystocia, especially to reduce the incidence of stillbirth, metritis, and injury to the dam.^{2,3} Training should provide clear information on how to identify animals at risk of dystocia under field conditions. The following elements are critical for calving personnel: 1) behavioral signs of the cow or first-calf heifer before and during labor, 2) when and how it is appropriate to assist the cow or first-calf heifer, 3) strategies to correct abnormal presentations or positions, 4) hygiene practices during assisted births, 5) accurate record-keeping of births, 6) best communication practices within the farm team (i.e., when to call for help), and 7) best newborn care practices. For calving personnel to be able to identify and intervene in dystocic births, it is essential that they understand the normal characteristic signs and normal delivery times for eutocic births as well as difficult births (dystocia). Being able to recognize the characteristics of normal delivery is critical to determine the appropriate time for intervention in dairy cows or first-calf heifers requiring assistance at calving. This fact sheet will present information about 1) the imminent signs of birth and calving progress (normal versus dystocia), 2) how to determine if Holstein first-calf heifers or cows need assistance at calving, and 3) strategies to reduce the incidence of stillbirth under field conditions.

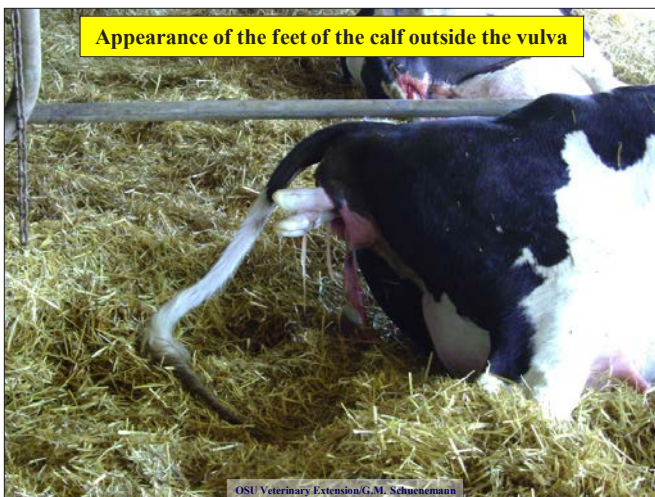
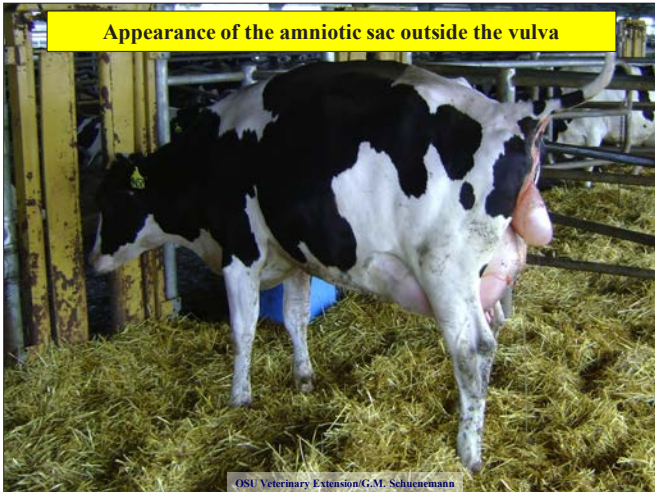
Imminent Signs of Births, Calving Progress, and Reference Times for Intervention

Normal Eutocic Births

Recognizing the signs of imminent birth (normal or abnormal) and the behavior of the cow or first-calf heifer before or during parturition is critical to identifying those animals that need assistance (difficult births). Calving, or birthing of a calf, is a natural process that is divided into three stages (I, II, and III), and under normal conditions, calving progresses gradually from one stage to the next.^{2,8,9} Stage I is characterized by dilation of the soft tissues of the birth canal, including the ligaments of the pelvis, cervix, and vulva. Enlargement of the mammary gland, distension of the vulva and perineum region, and vaginal fluid discharge are signs of imminent parturition in Holstein dairy cows or first-calf heifers. Regarding behavioral signs, variation exists between cows and first-calf heifers as we approach the time of calving and thereafter. In general, stage I is characterized by frequent sniffing of the ground; licking body parts such as the hind legs or back; frequent discharges of urine and feces; frequent transition between walking, lying down, and standing (typical signs of discomfort before delivery) with frequent vocalizations and tail raised.^{2,10,11,12} It is important to note that many of the behavioral signs described above can be repeated in stage II and stage III. Stage I ends with full dilatation of the cervix and the appearance of the amniotic sac (AS), or water bag, outside the vulva. The appearance of the amniotic sac or feet of the calf outside the vulva should be used as reference landmarks to determine the calving progress and when to intervene.

Table 1: Description of scales used to determine the degree of dystocia according to the degree of assistance provided during parturition in Holstein herds.

Scale	Description of Dystocia	References
1 to 3 scale	1 = no assistance	Meyer et al., 2001
	2 = slight assistance	
	3 = needed assistance	
1 to 5 scale	1 = no assistance	Dematawewa and Berger, 1997 Lombard et al., 2007 Schuenemann et al., 2011b
	2 = assistance by one person without the use of mechanical traction	
	3 = assistance by 2 or more people	
	4 = assistance with mechanical traction	
	5 = surgical procedure	
Combination of both	Description is based on calving difficulty	Mangurkar et al., 1984 Schuenemann et al., 2011b



Stage II (expulsion of the calf) is characterized by the appearance of the AS outside the vulva, the onset of abdominal contractions, and the progress of the calf through the birth canal.^{2,8} Under normal conditions, the calving progress and birth is characterized by the appearance of the feet of the calf outside the vulva, and it is followed by the nose and head (front presentation) or by the tail and pelvis of the calf in posterior presentation. Stage II ends with the delivery of the calf or calves (as with twin or triplet births).^{2,8} In Holstein cows (multiparous), stage II is characterized by a lying down position at the onset of abdominal contractions and by remaining in the same position until birth.² The AS appears immediately before or after the onset of abdominal contractions, and the calving progress (showing feet of the calf followed by the nose, head, shoulder and birth) is evident every 15–20 minutes.² Abdominal contractions are frequent (between 3 and 9 abdominal contractions every 3 minutes) as calving progresses.² Under normal conditions, when the head and shoulder of the calf are outside the vulva, 2 or 3 intense abdominal contractions complete the birth.²

For first-calf Holstein heifers, stage II of labor is characterized by frequent changes of position (from standing to lying), mainly at the beginning of stage II or even at the end of stage I.² When the calf is positioned into the birth canal and the feet or head is outside the vulva, the heifer usually remains recumbent with abdominal contractions and clear calving progress every 15–20 minutes.² In Holstein heifers, at the time of the birth, the abdominal contractions are more numerous compared with multiparous cows.² In cows or heifers experiencing normal eutocic births, the mean time from the onset of AS or feet of the calf outside the vulva to birth was estimated in 70 to 65 minutes, respectively.²

Finally, stage III covers the period from birth until the expulsion of the fetal membranes. Immediately after birth, the cow or heifer stands up (if was previously lying down) and starts sniffing and licking the calf. Normally, the expulsion of fetal membranes should occur within the first 24 hours after birth in both cows and first-calf heifers.^{13,14} It is common to observe that some animals eat the fetal membranes. To avoid any inconvenience (such as choking or suffocation), the fetal membranes should be removed from the maternity or fresh pen immediately after expulsion.



Assisted or Dystocic Births

Recognizing the characteristics and behavioral signs of normal births in cows or first-calf heifers are critical to correctly identify the signs of dystocia. A recent study examined the characteristics of difficult births under field conditions in Holstein cows and first-calf heifers.² During stage II of difficult births, the appearance of the AS outside the vulva was observed about 18 minutes after the onset of abdominal contractions.² The appearance of the feet and nose of the calf, clear signs of calving progress, was observed between 36 and 48 minutes after the onset of the AS.² It is important to note the difference in calving progress between normal births (the progress is evident every 15–20 minutes) and dystocia. With dystocia, progress is slow or you only see the feet and nose of the calf, without progress, despite constant abdominal contractions.²

While the frequent change of position (transition between standing and lying down, and vice versa) is a clear sign of discomfort in heifers with dystocia, it is also observed in heifers with normal deliveries.² When heifers experience difficult births, the number of abdominal contractions often decreases significantly (as well as in intensity) after two hours of intense labor.^{2,12} This is a clear sign of fatigue and should be taken into account when determining the appropriate time for intervention in first-calf heifers. Calving personnel should constantly monitor the calving progress and the time that a cow or heifer is in labor. Generally, the time in labor (abdominal contractions and progress of the calf through the birth canal) starts at the onset of stage II, with the appearance of the AS outside the vulva.² In practice, the appearance of the AS should be the time “zero” and should be used

as a reference landmark to determine whether the cow or first-calf heifer is experiencing dystocia and in need of assistance (Table 2).

The appearance of the AS and/or feet of the calf outside the vulva, combined with the signs of calving progress, are clear indicators that calving personnel can easily identify under field conditions. The time that a cow or first-calf heifer spent “in labor” (straining) and the estimated times from the appearance of the AS or feet of the calf outside the vulva should be used as guidelines to determine the appropriate time for intervention during dystocic births (Table 2). It is important to note that if malpositions are evident (e.g., only one foot of the calf is visible outside the vulva) after the appearance of the AS or for uterine torsion (where nothing is visible outside the vulva), the cow or heifer must be assisted. Immediately after delivery, it is important to examine the cow or heifer to determine the presence of a second calf in case of multiple births (twin or triplet). Early intervention has the potential to prevent stillbirth, but also has the potential for dam injury due to lack of soft tissue dilation. To implement these obstetric concepts under field conditions, calving personnel should receive appropriate training to correctly interpret these signs and reference values and to determine whether the cow or heifer needs assistance.

These recommendations work best if dairy personnel monitor cows every 2 hours, as the frequency of observation is critical to determining the onset of the AS or feet of the calf outside the vulva.

Dystocia Management and Stillbirth

Prevention of dystocia should be a top priority in dairy herds. The use of tested sires for their ease of calving (calves

Signs of Normal Births	Description	References
Appearance of the AS or feet of the calf outside the vulva	Landmark references	Noakes et al., 2001 Schuenemann et al., 2011b
Signs of calving progress	Evident every 15–20 minutes	Schuenemann et al., 2011b
Average time since the appearance of the AS outside the vulva to birth	70 minutes(*)	Noakes et al., 2001 Schuenemann et al., 2011b
Average time since the appearance of the feet of the calf outside the vulva to birth	65 minutes(*)	Schuenemann et al., 2011b
Time that a cow or first-calf heifer is in labor (abdominal contractions)	≤2 hours	Gundelach et al., 2009 Schuenemann et al., 2011b
Frequency of observation	Every 2 hours	Schuenemann et al., 2011b
*The mean times were estimated using the mean + 2 SD (standard deviation).		

with low birth weight), especially for first-calf heifers, is an essential management tool to prevent dystocic births and stillbirth.¹⁵ Stillbirth is defined as a calf born dead at term or as a calf dying within 24 hours after birth. Animals that show excessive body condition or excessive weight loss during the last trimester of pregnancy are prone to dystocia.^{9,16} Therefore, appropriate nutrition management of cows during pregnancy, removal of heifers with small pelvic areas, and the use of proven sires known for their calving ease at time of artificial insemination have the potential to significantly reduce dystocia and its negative effects in commercial dairy herds. Training of calving personnel and hands-on demonstrations (i.e., discussion group) are paramount to make sure calving personnel understand the concepts and to make any necessary clarifications. In previous studies using these learning methodologies, calving personnel were able to significantly increase their level of knowledge and reduce the incidence of stillbirth by about 9 percentage points (from 15.5% to 6.5%).¹⁸ Continued training of dairy personnel (both permanent and new employees) on dystocia management should be a top priority for dairy herds to minimize the economic losses associated with dystocia (stillbirth, cow mortality-replacement, metritis, and/or reduced cow productivity).^{9,15,16,17,18,19}

Final Remarks and Practical Tips

Economic losses associated with dystocia can have severe consequences in dairy herds due to an increased number of stillbirth and maternal injury. Moreover, the impact of dystocia also negatively affects the productive and reproductive performance of lactating dairy cows due to increased risk for uterine disease (metritis) and ovarian dysfunction. The following elements should be taken into account when designing management strategies to reduce the negative effects of difficult births.

At the Farm Level

1. **Intervention:** Being able to recognize the imminent signs of calving is critical for positive outcomes. Usually, once the AS appears outside the vulva, the birth should occur within 70 minutes. Call your veterinarian if there is no progress 30 minutes after your intervention. For first-calf heifers, once the nose/feet of the calf are outside the vulva, help finish the birth. For backward presentations in cows or first-calf heifers, help finish birth. Establish calving protocols (including the frequency of observations, and how and when it is appropriate to intervene) and have them available. If suspected, check for hypocalcemia and uterine torsion.^{21,22,23}

2. **Hygiene Practice:** The cleanliness of the perineal region (presence of feces or dirt) in cows at calving is significantly associated with metritis. Maximize the comfort of the cows in the close-up pen and keep it clean and dry. If intervention is required, a) wash the perineum region with disinfectant soap and water, b) disinfect the obstetric chains before and after use, and c) use lubricant and disposable gloves.

3. **Protocols:** Calving protocols should be reviewed and adjusted (if necessary) twice a year. Make sure your calving personnel know what to look for/monitor before and during calving and why it is important. Also, they should be able to communicate calving records with the farm team and follow the protocols established. If the incidence of stillbirth is around 11–15%, provide training to your calving personnel (keep the incidence of stillbirth below 6%).

4. **Records:** Keep complete and accurate records of the events associated with calving (at minimum, record the degree of calving difficulty, newborn gender, identification of the mother and calf, birth date, start and end time of calving, and if the calf was born alive or dead). Calving personnel should be able to communicate the events of births with the herd team.

At the National Level

1. **Selection programs for sires with calving ease genetics:** The use of proven sires with ease of calving should be a top priority for dairy producers, for both first-calf heifers and cows. This combined with proactive management at the farm level should significantly reduce the negative effects of dystocia, especially the incidence of stillbirth and metritis, thus improving the overall herd productivity.

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