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Calving Emergencies in Beef Cattle: Identification and Prevention

W. Dee Whittier, D.V.M., Extension Veterinary Specialist, Virginia Tech
Nancy M. Currin, D.V.M., Extension Veterinary Publication Specialist, Virginia Tech
John F. Currin, D.V.M., Extension Veterinary Specialist, Virginia Tech
John B. Hall, Extension Beef Cattle Specialist, Virginia Tech

Calving difficulty, technically called dystocia, is a major cause of death loss in cow-calf herds. CHAPA (Cow-calf Health and Productivity Audit) studies indicate that dystocia is responsible for 33 percent of all calf losses and 15.4 percent of beef cattle breeding losses. Dystocia can have a large economic impact on producers due to calf death, veterinary costs, decreased rebreeding efficiency, and injury or death to the cow. In three different studies, dystocia was the highest veterinary cost to cow-calf operations in Colorado, California, and Tennessee. (Salma *et al*., April and May 1991) Dystocia is also the number one cause of calf mortality in the first 96 hours of life. (Patterson *et al*.) Pregnancy rates for the dam after losing a calf are lower than for dams that have not lost a calf. (Patterson *et al*.) Studies also indicate that animals experiencing dystocia while delivering a live calf may have decreased rebreeding rates. Therefore, a sound management program to reduce dystocia and rapidly identify cattle experiencing dystocia is critical to cattle welfare and farm profitability.

General

The average length of gestation for cattle is 280 days, with a normal range of 273 to 296 days. A twin pregnancy will average 3 to 6 days less.

There are three stages of labor in normal calving:

1. **First stage:** The first stage of labor is when the cervix is dilating. This stage can last between 1 and 24 hours, but usually it is between 2 to 6 hours. Cows will often separate from the herd, and may be restless. They will not eat or drink and can have a vaginal discharge.
2. **Second stage:** The second stage begins when the cow starts contracting and continues until the calf is delivered. The amniotic sac, or water bag, will appear at the vulva. The fetus starts to enter the birth canal which then stimulates contractions that can be seen as abdominal press. A general rule is that delivery should be complete within 2 hours after the amniotic sac appears.
3. **Third stage:** The third stage is when the placenta (afterbirth) is delivered. The placenta usually passes within the first 8 hours after birth. It is considered "retained" at 12 to 24 hours, but manually removing the afterbirth is not recommended.

Dystocia is when it becomes difficult or impossible for the cow to deliver the calf without assistance. It can occur in the first and/or second stage of labor. Producers may not know the exact time the cow goes into labor, but careful observation, and knowing the general guidelines will help identify dystocias early.

Causes of Dystocia

The most common causes of dystocia are maternal/fetal disproportion, abnormal position of the calf during delivery, incomplete dilation of the cervix, uterine inertia (the uterus will not contract, or becomes "exhausted"), uterine torsion, twins, and abnormal fetuses.

Currently in the U.S., the most significant cause of dystocia is maternal/fetal disproportion. This is a condition when the calf is too large for the female to deliver without difficulty. Heifers are at the greatest risk of maternal/fetal disproportion. Current recommendations to maximize profitability and decrease dystocias are to calve heifers at 24 months of age. Calving heifers at 24 months of age minimizes the feeding expenses associated with developing heifers while keeping the heifers calving during the same calving season as the mature cows. Well-managed and properly grown heifers will only be 85 percent to 90 percent of mature cow size at 24 months of age and not have as much room in their pelvis (birth canal) as do mature cows; however, underdeveloped heifers may only be 60 percent the size of mature cows and are at much greater risk of dystocia.

Improper nutrition may not only result in heifers being too small at breeding, but also may compromise the amount of energy available for labor. Undernourished heifers are more likely to become exhausted and have prolonged deliveries. In contrast, heifers that are too fat may have difficulty delivering calves because of the excess fat in the birth canal.

Cow-calf producers get paid for pounds of calf produced. Therefore there has been a trend towards selecting larger cows, and bulls that produce calves with heavier weaning weights. As genetics became better understood, it was apparent that there is a link between birth weight and calf growth. Calves that had higher growth potential also had higher birth weights. Another important factor that was discovered is that the bull primarily determines the birth weight of the calf. So the industry found that by breeding for more growth in their calves, they were also creating many more dystocias.

Diagnosis

The big question is: when is a delivery a dystocia rather than a normal birth? If the amniotic sac appears at the vulva, then a good rule of thumb is the calf should be born within 2 hours. For a mature cow, it will probably be closer to 1 hour. If you do not know when the animal began labor, the most reliable way to assess if the animal is having trouble is the progress it is making. A cow or heifer should be making visible progress every 20 to 30 minutes that she is in active second-stage labor. One that frequently tries to urinate or walks with her tail up and extended for more than 3 to 4 hours may have a uterine torsion (twisted uterus), an abnormally positioned calf, or other condition that blocks passage of the fetus and membranes so they are not visible.

If there is an extended second-stage labor or the animal is not making progress or frequently assumes a urinating posture over several hours, it needs to be examined. When examining a cow, good sanitation is very important, so as not to introduce infections which can cause future reproductive problems. You will need proper restraint for the animal that should include access to a chute and headgate. Clean the vulva with a mild soap and water and wear plastic OB sleeves to protect both the cow and you from infectious agents. The vulva should be relaxed and free of obstructions like fat and pelvic fractures, and the cervix should also be relaxed and dilated large enough for the calf to pass through. When you pass your hand along the birth canal, there should not be any band marking the border between the birth canal and uterus, that is, you cannot identify the cervix. Next, determine the position and size of the calf. The normal position for a calf during delivery is both front legs extended with the head following and facing forward in a "diving" position (See Figure 1). If the cow is dilated and the calf is in the normal position, but still no progress is being made, maternal/fetal disproportion is likely. Never attempt to deliver a calf in an abnormal position without first correcting its presentation as you could cause irreparable damage to the cow. Call a veterinarian if there is any question regarding the presentation of the calf or as soon as you have exceeded your ability or comfort level. Further information on correcting calf positions and assisting deliveries will be discussed in a future Extension publication entitled *Calving Emergencies in Beef Cattle: Treatment*.

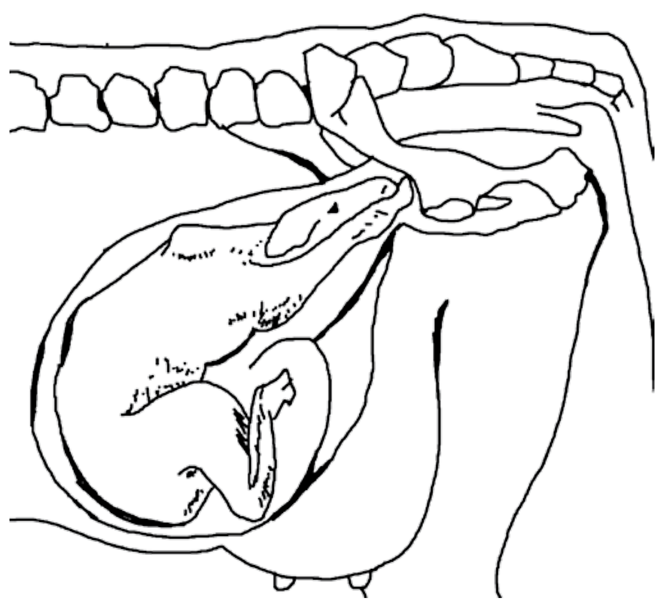

Figure 1. Calf in the correct position for a normal delivery.

Prevention

Because many of the causes of dystocia, such as abnormal calf position and uterine torsion, are sporadic and unpredictable, prevention focuses primarily on correcting fetal/maternal disproportion and nutrition.

Maternal/fetal disproportion

There are two factors to consider with maternal/fetal disproportion: the size of the dam at calving, and the size of the calf. Because heifers are generally smaller than cows, they have an increased risk of dystocia. The size of heifers at breeding should average 66 percent of their mature weight, with a minimum of 60 percent. Heifers must then gain 1.5 to 1.75 pounds per day from breeding until calving. This will make them 85 percent to 90 percent of their mature body weight plus 100 pounds at calving. The 100 pounds is important as that takes into consideration the weight of the calf and the associated fluids. Tables 1 and 2 summarize the target and minimum weights of heifers to avoid dystocia.

Nutritional approaches to meeting target sizes

Developing proper diets and feeding strategies for meeting the target weights indicated in the tables below is critical. However, diet recommendations need to be based not only on the required rates of gain for heifers to meet target weights but also the nutrient quality of the base forage. Producers are encouraged to work with Extension agents or consulting nutritionists to develop custom diets for their heifer development program.

The tables below offer limited information on the nutrient requirements of beef replacement heifers at different stages of development. For more detailed information on nutrient requirements for pregnant heifers see *Nutrition and Feeding of the Cow-Calf Herd: Production Cycle Nutrition and Nutrient Requirements of Cows, Pregnant Heifers and Bulls*, Virginia Cooperative Extension publication 400-012, which is available at *www.ext.vt.edu/pubs/beef/400-012/400-012.html* or from your local Extension agent.

Heifers need to consume sufficient amounts of high-quality feed in order to gain weight. The amount of dry matter they need each day is indicated in Table 3. The actual amount of feed needed depends on the water content of the feed. For example, a 700-pound heifer

Table 1. Target weights sized to avoid dystocia.

Mature body weight (BW) of cow* (lbs)	Breeding weight (66% of mature BW of heifer) (lbs)	Weight at 5-month pregnancy check (lbs)	Precalving weight (lbs) (90% +100 lbs of mature BW)	After calving weight (lbs) (90% of mature BW)
1000	660	830	1000	900
1100	726	913	1100	1000
1200	792	996	1200	1100
1300	858	1079	1300	1200
1400	924	1162	1400	1300

*Projected mature body weight or average size of cows in herd.

Table 2. Minimum weights to avoid dystocia.*

Mature body weight (BW) of cow (lbs)	Breeding weight (lbs) (60% of mature BW of heifer)	Weight at 5-month pregnancy check (lbs)	Precalving weight (lbs) (85% of mature BW +100lbs)	After calving weight (lbs) (85% of mature BW)
1000	600	800	950	850
1100	660	880	1035	935
1200	720	960	1120	1020
1300	780	1040	1205	1105
1400	840	1120	1290	1190

*The minimum size is more likely to result in dystocia than the target size and uses 60% of mature cow size.

Table 3. Dry matter intake requirements of replacement heifers.

Heifer Weight (lbs)	Daily Dry Matter Intake (lbs)	Heifer Weight (lbs)	Daily Dry Matter Intake (lbs)
400	9.2	800	18.4
500	11.5	900	20.7
600	13.8	1000	23.0
700	16.1	1100	25.3

Adapted from NRC, 1996

needs to eat 19 pounds of good-quality dry hay to eat 16.1 pounds of dry matter per day. In contrast, the same heifer would have to eat 46 pounds of silage to meet her dry-matter requirement because silage is so moist.

The next most important factor is that a heifer consumes a diet high enough in nutrients to grow properly and to supply nutrients to the developing fetus. Table 4 indicates the minimum nutrient levels needed in their diets for heifers to meet the indicated gains. If heifers need to grow faster or slower their nutrient needs will be different. Contact your Extension agent or nutritionist for more help.

A few example diets for developing heifers are illustrated in Table 5. Producers are strongly encouraged to analyze forages for nutrient content. There are numerous resources available to help producers develop custom diets for their own operations.

Mineral Supplementation

Growing and pregnant heifers require significant amounts of calcium (Ca), phosphorus (P), and trace minerals. For most diets, a high-quality complete mineral supplement (including trace minerals) with a calcium to phosphorus ratio of 2:1 will meet the needs of growing and pregnant heifers. However, when heifers eat diets with greater than 3 to 4 pounds of corn-gluten feed, soy hulls, brewers grains, or distillers grains, they need a mineral supplement with a Ca:P ratio of 4:1. In some cases, no supplemental phosphorus is required.

Copper (Cu), manganese (Mn), selenium (Se), and zinc (Zn) are important trace minerals for replacement heifers. Recommended levels in mineral supplements are 1,500 parts per million (ppm) Cu, 3,000 ppm Mn, 3,600 ppm Zn, and 60 ppm Se.

Table 4. Minimum required dietary nutrient levels for replacement heifers.

Heifer description		Nutrient density of diet (as a % of dry matter consumed)			
Growth Phase	**Rate of gain (lbs. per day)**	**% TDN**	**% CP**	**% Calcium**	**% Phosphorus**
Weaning to breeding normal growth	1.7	58	11	.34	.18
Weaning to breeding high growth	2.0	61	12	.39	.20
Weaning to breeding low growth	1.25	54	9.5	.28	.16
Early gestation breeding to pregnancy exam	1.25	52	8.0	.24	.18
Mid gestation 2nd trimester	1.5	54	8.5	.22	.18
Late gestation Last trimester	2.0	57	8.5	.30	.22

Adapted from NRC, 1996

Table 5. Example diets for developing replacement heifers (weaning to breeding).

Medium Frame Heifers with a Target Average Daily Gain (ADG) of 1.5 lbs			
Heifer Weight 550 lbs	**Low-Quality Hay**	**Average-Quality Hay**	**High-Quality Hay**
Hay	9.0 lbs	11.0 lbs	13.5 lbs
16% Supplement	7.0 lbs	5.0 lbs	3.0 lbs
Mineral Supplement	0.25 lbs	0.25 lbs	0.25 lbs
Large Frame Heifers with a Target Average Daily Gain of 1.75 lbs			
Heifer Weight 650 lbs	**Low-Quality Hay**	**Average-Quality Hay**	**High-Quality Hay**
Hay	10.5 lbs	13.0 lbs	15.0 lbs
16% Supplement	6.5 lbs	4.5 lbs	2.5 lbs
Mineral Supplement	0.25 lbs	0.25 lbs	0.25 lbs

Note:

16% Supplement = 82% Total Digestible Nutrients (TDN), 16% Crude Protein (CP) Examples = Corn gluten, corn and soybean, beef commercial products

Low-Quality Hay = 50% TDN, 8% CP

Average-Quality Hay = 54% TDN, 9.5% CP

High-Quality Hay = 59% TDN, 12% CP

Miscellaneous

Measuring the pelvic area of the female prebreeding has been attempted to determine how big a calf she could deliver. The prebreeding pelvic area should be a minimum of 150 square cm. One challenge to the system is that there is so much variation among the results obtained by the operators taking these measurements. (Vandinkersgoed *et al.*) The pelvic-area measurement should never be used to select animals for bigger pelvic area as this will select for large-frame cattle. Pelvic measurement should be used as a culling tool, not as a selection tool.

Decreasing Calf Size

Decreasing the calf size will also significantly help prevent dystocias. Some breeds, such as Longhorns, have smaller birth weights, but, unfortunately, they also have less growth. For most producers this is unacceptable. In the bovine, the heritability of birth weight is almost 48 percent. That means the female alone doesn't control or "limit" the size of the calf. Therefore a cow bred to a bull that produces large calves may have a large calf regardless of her size.

EPDs (Expected Progeny Differences) are used to predict how one bull's future progeny (offspring) will compare to other bulls' future progeny **within a breed.** EPDs are much more accurate in predicting the performance of a bull's progeny than looking at individual records because it incorporates the animal's records, its parents records, its siblings records and its progeny records. EPDs are available for many desirable characteristics, but the most important EPD to evaluate for dystocia prevention is birth weight. In recent years, bulls that sire calves with low birth weights, have been identified. These are considered "calving-ease" bulls. In the Angus breed, bulls with an EPD for birth weight of +2 or less are considered calving-ease bulls. Other breeds are compared with this using across breed EPDs (see Table 6). Having a calving-ease bull with good growth traits is highly desirable. Semen from sires is available for artificial insemination, or their calves may be purchased as bulls. For most producers who buy bulls to run with their cows, the only data that is known is how the purchased bull's sire performed. Because these characteristics are consistently passed on to their offspring, the sire's information is generally reliable for the offspring as well. In this situation the sire's EPD accuracy should be looked at closely.

The accuracy value (ACC) of EPDs is how reliable the EPDs are. The accuracy is based on the quantity and quality of information used in the EPD of a sire and is ranked from 0 to 1. The higher the ACC value, the higher the accuracy. Therefore, in looking at birth-weight EPDs, there is more risk that a bull will sire larger calves if the accuracy is 0 than if it is higher. An animal's EPDs and ACC will change yearly as more information is available. In general, younger bulls have lower accuracy because there is less information available for them.

As mentioned before, EPDs are a way to compare bulls within a breed. An across-breed adjustment factor is now available to compare EPDs from bulls of different breeds. The adjustment factor uses the Angus breed as a reference point so the adjustment factor for all Angus EPDs is 0. To use across-breed adjustment factors accurately, you must use the latest charts for EPD adjustment and Breed Average EPDs. They are published and recalculated every year.

To calculate average across-breed EPDs for birth weight, the adjustment factor for birth weight EPD is added to the breed average EPD for birth weight.

Table 6. Current active sires EPD beef breed averages and EPD adjustment factors for birth weight 2006.

Breed	Breed Average EPD for Birth Weight	Across Breed Adjustment Factor for Birth Weight EPDs
Angus	+2.3	0.0
Charolais	+1.2	10.0
Gelbvieh	+1.9	4.7
Hereford	+3.7	2.9
Limousin	+2.3	4.1
Red Angus	+0.6	3.0
Simmental	+2.4	5.8
Beefmaster	0.0	9.2

Example: (Using chart from Table 6) Comparing average birth weights between the Red Angus and Simmental breeds:

Red Angus 3.0 (adjustment factor for BW EPD) + 0.6 (breed ave EPD for BW) = 3.6

Simmental 5.8 (adjustment factor for BW EPD) + 2.4 (breed ave EPD for BW) = 8.2

The average Simmental bull will sire calves that are 4.6 pounds (8.2 – 3.6 = 4.6) heavier than the average Red Angus bull when mated to an Angus cow (the reference point).

To compare two specific bulls from different breeds, the same calculation can be done by adding the across-breed adjustment factor for BW EPD to that sire's **within-breed EPD** for birth weight**.** Within-breed EPDs are also published and recalculated yearly, and the latest information is necessary for accurate comparisons. Across-breed EPDs are helpful when multiple breeds are used in a breeding program to maintain uniformity and make sure there are no large fluctuations in birth weight and other characteristics when a new breed is introduced.

General Nutrition

Pregnant heifers and cows should be in good condition, especially in the last one-third of their pregnancy. Increasing the energy content in late pregnancy may have some helpful effects on shortening labor times and decreasing dystocia. Conversely, cows that were fed a severely restricted protein diet in late pregnancy had higher calf deaths and dystocias. (Waldhalm *et al.*) For spring calving herds, heifers and cows are in late pregnancy during mid to late winter. If these females have only been fed average- to poor-quality hay throughout the winter, they may enter the last trimester of pregnancy with a thin body condition. By the time they are due to deliver, they have a greatly increased chance of having problems with dystocias, calf deaths, or becoming a down cow. Because heifers have higher nutritional needs than cows, they should be housed/pastured and fed separately during the last 2 to 3 months of pregnancy. This will also prevent cows from being overfed, which has also been shown to increase the likelihood of dystocias. Additionally, separate housing/pasturing is helpful during calving as "higher-risk" heifers will be together and can be watched more closely. During the calving season, checking late gestation heifers and cows every 2 to 4 hours is ideal.

Alternatives to Raising Heifers

When calving heifers, one must assume that that there will be some problems with dystocias. Therefore, calving heifers successfully as 2-year-olds requires additional facilities and expertise. This may not be practical for some small and/or inexperienced producers. There are several alternatives:

- Utilize contractors to grow out, breed, and calve heifers (or any part thereof).
- Sell heifers and purchase mature cows.

The advantages of not calving your own heifers includes:

- Avoid dystocias in heifers.
- Increase cash flow by selling heifers.
- Avoid the problems of breeding back heifers.
- Utilize bulls longer because there is not a concern of breeding daughters.
- No need for additional heifer facilities.

The disadvantages of not calving your own heifers:

- Expense of contractors.
- Biosecurity when purchasing animals. (We buy many of our disease problems. Purchasing animals from Virginia Quality Assured (VQA) herds that have been tested for BVD, Johnes, Anaplasma [and other diseases as recommended in your area] and that have good disease-free reputations reduce the biosecurity risk.)

Summary

Dystocias and their associated losses can have a significant economic impact on cow-calf producers. Good nutrition and breeding programs are essential to decrease the incidence of dystocias and maximize profitability. The major cause of dystocias in the United States is fetal/maternal disproportion. This is often a preventable condition. By making sure that heifers are adequately grown before breeding and choosing bulls that produce smaller calves with good growth, the beef industry can continue producing quality calves while reducing the incidence of dystocias.

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