

# Dairy Worker Training in Newborn Calf Management

Franklyn B. Garry, DVM, MS; Ivette N. Román-Muñiz, DVM, MS; Jason E. Lombard\*, DVM, MS; David C. Van Metre, DVM

*Integrated Livestock Management, Colorado State University, Fort Collins, CO 80523*

*\*USDA:APHIS:VS Centers for Epidemiology and Animal Health, Fort Collins, CO 80526*

## Abstract

Dairy calf death rates from birth to weaning approximate 8 to 10% in the US. Stillbirths on dairies, measured as calves dead at delivery or within the first 24 to 48 hours after delivery, are less closely monitored, but are estimated between 6 and 12%. Numerous factors influence calf health and survival, but the key contributors to calf morbidity and mortality can be managed to greatly reduce these losses. Except on small dairies, most calving events and postnatal calf care are overseen by paid employees. As the available dairy workforce has changed over time, it is common that the people making critical decisions about newborn calves do not have extensive prior experience in calf management. Workers with appropriate education and training, provided with good calf management protocols, can dramatically improve calf health and survival.

## Résumé

Dans les fermes laitières des États-Unis, de 8 à 10 % des veaux nouveau-nés meurent entre la naissance et le sevrage. La mortinatalité, mesurée par le nombre de veaux morts au vêlage ou dans les 24 à 48 heures qui suivent, est moins étroitement surveillée, mais elle affecterait de 6 à 12 % des naissances. De nombreux facteurs influencent la santé et la survie du veau. Toutefois, en contrôlant les principales causes de morbidité et de mortalité, on peut réduire les pertes de façon importante. Sauf dans les petites fermes laitières, ce sont les employés salariés qui surveillent la plupart des vêlages et qui se chargent des soins postnataux des veaux. La main-d'œuvre laitière ayant changé avec le temps, il arrive souvent que les personnes prenant les décisions critiques concernant les veaux nouveau-nés n'ont pas d'expérience approfondie dans la régie des veaux. Or, des employés éduqués et formés adéquatement, à qui l'on fournit de bons protocoles de régie des veaux, peuvent considérablement améliorer la santé et la survie de ces jeunes animaux.

## Introduction

National survey data concerning dairy calf health and survival have shown little change in success rates

over the last 10 to 15 years. The National Animal Health Monitoring System reports the number of unweaned dairy heifer calf deaths as a percentage of calves born alive to have varied from about 8.5 to 10.8% between 1991 and 2002.<sup>17</sup> Most causes of death reported by producers are infectious diseases, most commonly scours/diarrhea and respiratory problems.<sup>16,17</sup> Because infectious diseases are the most prevalent calf health problems between birth and weaning, veterinarians and other dairy health advisors have placed considerable emphasis on vaccination strategies and colostrum administration as key features of calf management.

Compared with infectious disease reporting, much less emphasis has been placed on stillbirth as a cause of calf death. Death losses at delivery, or within the first two days after delivery, which is the commonly used definition of stillbirth in the dairy industry, are rarely the result of infectious disease. These deaths typically result from physiological derangements of newborns during delivery or during adaptation to life outside the uterus.<sup>5,8,18</sup> Although these losses are less carefully tracked in the industry, current reports suggest stillbirth rates between 6 and 12%, thus almost as common as infectious disease in causing calf death.<sup>7</sup> While there are numerous potential causes of stillbirth, including genetic and nutritional problems, dystocia is the single most common predisposing cause of stillbirth.<sup>7,10,11,12,13</sup>

Dystocia delivery is not only responsible for dramatically increasing the likelihood of stillbirth, but also increases the risk for subsequent calf health problems.<sup>10</sup> By disturbing adaptation to extra-uterine life, dystocia impairs normal physiological functions, increases the risk of poor colostrum transfer and decreases resistance to infectious pathogens, therefore increasing infectious disease likelihood.<sup>3,4,8,10</sup>

For a calf management program, the day of delivery is the single most critical time. Although dystocia cannot be eliminated, its effects on the cow and calf can be mitigated by proper management and decision-making. Calves from dystocia delivery, plus calves born without dystocia that are slow in adaptation, can be identified and managed to increase their survival.<sup>8,9,18</sup> Colostrum management and appropriate calf biosecurity measures also need to occur in this critical first day.<sup>18,19</sup> If optimum calf health is the goal, all of the observations, decisions and actions involved in delivery and the first day

of a newborn calf's life should be performed by well trained workers who are educated about the importance of their work to the long-term health of the calf.

It should be a common philosophy among dairy veterinarians that it is far preferable to get off to a good start and assure/maintain health than to make up for deficiencies later and treat disease. With these principles in mind, it is important to recognize that the overwhelming majority of all dairy calves delivered in the US will be attended by dairy personnel rather than veterinarians. What takes place during a delivery, and how calves are observed and treated after delivery will depend mainly upon the knowledge, skills and focus of dairy personnel.

### **The Delivery Process and Normal Calves**

Birth is the most dramatic transition that an animal ever makes, despite its relatively high rate of success. The birthing process itself is attended by the trauma and stress of delivery and a period of anoxia/asphyxia, all of which are exaggerated in the event of dystocia.<sup>5,8</sup> In addition, the newborn must adapt to its extrauterine environment. During this process, virtually every organ system and every metabolic process is affected. Within just a few minutes of time, the neonate must exchange its own respiratory gases, remove its own waste products, generate heat and thermoregulate, alter and regulate its blood flow and, in the case of an ungulate, it must begin to ambulate and seek its own food source.

In cases of dystocia, prolonged birth asphyxia can present a significant challenge to the health of the newborn calf.<sup>3,5,8</sup> Because removal of the calf from the birth canal is the primary focus of most assisted deliveries, the process is often considered successful when the calf has been delivered, and careful assessment of the calf is often forgotten. There is a strong tendency to assume calves will survive and perform normally, and no specific treatment or monitoring is initiated. Commonly, problems in calves following dystocia are detected long after the optimal time to address them, and the fact that the problems are associated with dystocia goes unrecognized.<sup>10</sup> Better health can be achieved in dystocia-affected calves if a routine monitoring system is followed and supportive care is provided before problems develop.<sup>8,18</sup> The most important first step in improving survival and health of calves following dystocia is recognizing that all such calves are compromised by the dystocia event.

A description of the normal newborn calf provides the measure against which problems can be compared. Normal calves should be born from an uncomplicated vaginal delivery, should breathe spontaneously, and should show strong activity almost immediately after birth.<sup>9,18</sup> Good mothering attention from the dam should

provide nuzzling and licking in order to dry the calf and encourage it to stand. These are important aspects of 'normal' because they provide stimulus to the calf, promote activity and allow the haircoat to provide a thermal barrier.<sup>2,6</sup> Since dairy calves are orphaned in the dairy industry, humans should be obliged to provide the same 'normal' care, though this is infrequently practiced on dairies. Furthermore, to prevent prolonged exposure of the calf to a contaminated maternity environment, the calf should be promptly removed, which should require humans to provide the care that a dam would under other circumstances. Normal newborn calves may reasonably be expected to stand within one hour of birth. The calf's body temperature should not decrease below 101°F. An active suckling reflex should be present, even before the calf has stood, and the calf should have sought and suckled the dam's teats within two hours of birth. The calf should remain attentive, responsive and strongly active throughout the first two hours of life.<sup>6,9,18</sup>

### **Monitoring Delivery**

In the dairy industry, the problem of dystocia has traditionally been underestimated, resulting in poorly defined dystocia rates that are seldom studied. Actual dystocia rates for dairy cattle are difficult to find and interpret in the literature, reflecting the lack of attention the topic receives. A recent study evaluated 666,341 calving records and reported dystocia rates for primiparous and multiparous dams over a 12-year period.<sup>12,13</sup> They estimated a primiparous and multiparous dystocia rate (score>1) of 28.6% and 10.7%, respectively. Our recent study of the impacts of dystocia on calf health and survival included dairies with overall dystocia rates above 30%.<sup>10</sup> Since dystocia is a very common occurrence and the negative impacts on calf health are so profound, it is important for personnel to monitor frequently for impending delivery and to know when and how to intervene.<sup>1,10,15,20</sup>

Many veterinarians and producers in the dairy industry have found routine, well defined protocols to be useful tools in dairy management. Delivery management is a prime example of the challenges of protocol implementation. There is great individual variation between cows in the intensity of signs of first-stage labor, duration of first-stage labor, and rate of delivery of the calf during second-stage labor.<sup>20</sup> For workers to apply delivery protocols with good judgment requires that they be well educated about the delivery process, what to look for as normal versus abnormal delivery, what time periods are appropriate for waiting versus action, and how to observe cattle without disturbing their delivery.<sup>1,20</sup> In the event that close physical examination is required, workers need to be well trained in keeping cattle calm and doing vaginal examinations with good hygiene.

## Delivery Procedures

The ideal way to avoid the negative impacts of dystocia on calves and dams would be to prevent its occurrence. Given the apparent high incidence of dystocia in the dairy industry, efforts to minimize the problem seem well warranted.<sup>10,11,13,20</sup> However, dystocia is a complex problem without an easy management solution, so whatever efforts are made to promote easy deliveries will certainly not eliminate the problem. When dystocia does occur, prompt and well-directed efforts to assist delivery, as well as postnatal calf care are critical to minimizing the severity of the negative impact on animal health.<sup>8,9,20</sup> All personnel involved in calf delivery should be well educated about the process and well trained in appropriate skills and techniques. In our experience, it is uncommon for dairy owners or workers to have been educated and trained about calf delivery methods.

The most critical first step in educating dairy workers about dystocia management is to affirm an appropriate philosophy about goals. Difficult deliveries are commonly seen as problems or accidents or nuisances that need to be dealt with, but that interfere with productive work. It is easy to see how this attitude leads to inappropriate decision-making and behavior, for example: wait and deal with it later; get it over as quickly as possible; the job is done when the calf has been removed from the cow. Looked at from a different perspective, dystocia events are opportunities to provide care to a mother and baby that have a significant challenge. Our goal should be to provide the best, most well directed efforts to assure that both animals meet the challenge and go on to live healthy and productive lives. This philosophy leads to very different decisions and actions than the former attitude.

Learning issues for people delivering calves include a broad range of assessments and activities. Veterinarians have been educated on all these topics and can share that knowledge with the people who deliver calves on dairies. Important topics include: assessment of the dam; restraint and positioning; hygiene and lubrication; position, presentation and posture of the calf; assessment of calf viability; manipulation techniques; and guidelines for delivery procedures, including equipment needs, force and direction of pull, timing and assessment of progress.<sup>20</sup> It is critical for workers to develop the judgment to determine when to proceed, when to wait and when to call for professional assistance.

## Postnatal Monitoring and Calf Care

In the overwhelming majority of cases (except when a veterinarian delivers a calf in dystocia), the

farm personnel will be best positioned to identify and manage developing problems. Veterinary intervention will generally involve helping to establish and guide a system of newborn calf assessment and monitoring. This system should include specific guidelines on what parameters to evaluate and how to respond when abnormalities are seen. A description of the 'normal' calf was provided above. It is not difficult to develop a checklist system that confirms that the calf is doing well, versus problems are identified. Dystocia is a major contributor to postnatal calf problems, and all calves suffering from dystocia can be considered to need extra attention.<sup>5,8,10</sup> However, postnatal problems can develop in calves without preceding dystocia and a good monitoring system should identify these calves as well.<sup>8,18</sup>

Physiological disturbances in the neonate are typically multisystemic, and it is most common for a disturbance in one system to also impair the adaptation of others. The practical significance of this generalization is that it is advantageous to identify and treat all clinical problems in the early stages. Calves are remarkably resilient compared with some species, and often overcome severe physiological problems if provided with simple nursing care.<sup>9,18</sup>

Most neonatal problems show relatively subtle and nonspecific disease signs. These include inactivity, weakness, slowness in developing normal behavioral responses such as attempting to rise or nurse, and variable body temperature. Furthermore, it is common that severely compromised calves look relatively normal for the first 15 to 30 minutes after delivery while their catecholamine surge is still in effect, but then gradually become weaker and less responsive as time goes on. Heart murmurs and loud respiratory crackles are commonly heard during thoracic auscultation, both in normal and abnormal calves. Subtle signs of decreasing vigor or responsiveness are often the first evidence of compromise. An exception to this generalization would be the calf born with little or no normal response immediately post-delivery. Such calves are candidates for resuscitative procedures, and a reasonable description of calf resuscitation is beyond the scope of this paper.<sup>8</sup>

Body heat generation can be accomplished through several mechanisms including nonshivering thermogenesis, shivering thermogenesis and the metabolic heat of muscular activity. Each of these depends on other physiological activities such as normal oxygenated blood flow to appropriate tissues, normal supply of metabolites and homeostatic control of acid-base parameters, normal neuromuscular function, and behavioral drive to become active and stand.<sup>3,6,8</sup> It should not be surprising that one of the most common neonatal problems is hypothermia, and yet it is not common

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for dairy workers to monitor newborn calves' body temperature as an indicator of well-being.

The calf's body temperature is usually 1 to 2°F above the rectal temperature of the dam immediately after birth. The calf's temperature will usually drop to about 101°F (38.3°C) within 15 to 30 minutes after delivery. A typical sign of neonatal adaptive problems is a body temperature that continues to drop below this level. There are numerous likely causes of hypothermia that can occur even in very warm surroundings, including hypoxemia, poor circulation, acid-base disturbances, and calf lethargy and inactivity. Prompt drying with towels or warm hair dryers, application of heat lamps and heating blankets, as well as shelter from the elements are warranted for any calf suffering from dystocia or that fails to show normal efforts to rise within the first half to one hour after birth.<sup>2,9,14</sup>

A dam with good mothering instincts can frequently stimulate the calf, and thus is responsible for increased survival of her calves.<sup>14</sup> Decreased activity is usually characterized by delayed standing and suckling behavior.<sup>14,18</sup> These two critical activities generate heat and allow the calf to obtain nutrition and immunological support against disease. Thus, one of the most basic supportive care procedures for the compromised calf is to encourage good mothering behavior on the part of the dam or to directly intervene and provide that same mothering activity. On many modern dairies with contaminated calving areas and dams that are not selected for good mothering traits, it has become the norm to advise prompt removal of calves from the maternity area for infectious disease control reasons. Therefore, the dam's responsibilities should become the typical duties of any good calf manager and include rubbing the calf, lifting it to stand, encouraging it to walk about, providing colostrum via nipple feeder or, if no suckle is elicited after a couple of hours, providing colostrum via esophageal intubation.

A simple but effective monitoring program includes assessment of the dam's health, type of delivery, maturity of the newborn, and physical and behavioral characteristics of the newborn. Calves born from an ill dam or with any degree of dystocia, or that appear premature at birth, will have an increased likelihood of encountering adaptive problems.<sup>8</sup> If these problems are anticipated and treated before they manifest overtly, the likelihood of survival and reasonably good health can be increased dramatically. Such calves can be promptly dried and warmed, provided adequate shelter, stimulated to move about and suckle, and provided colostrum early and for a prolonged duration.<sup>9</sup> Additional treatments to circumvent hypoxemia and acidosis would include nasal insufflation of oxygen and intravenous fluid therapy if the dairy is prepared to provide such care. Hypoglycemia can be easily monitored and managed with intravenous supplementation.

The importance of colostrum to provide immunonaïve newborn calves with maternally derived immunoglobulins has been extensively emphasized in the veterinary literature for a considerable time, so will not be further explored here.<sup>9,14,19</sup> However, the benefits of colostrum to calves go well beyond provision of antibodies. Dairy workers should be educated that a good colostrum management program is critical to newborn calf health for many reasons. Colostrum provides a very concentrated source of critical nutrient elements to the newborn, including numerous micronutrients as well as high levels of energy. Colostrum also provides the first source of fluids, necessary to expand blood volume. Properly warmed, it is also an important source of heat for the baby calf. Recent research has focused on some of the immune-protective factors besides antibodies, such as non-immunoglobulin proteins and maternal immune cells.

An additional note is warranted concerning colostrum consumption. Calves born in dystocia or with physiological disturbances from some other cause are more prone than their normal counterparts to poor colostrum immunoglobulin protection. This tendency is attributable to numerous factors, including delayed or decreased consumption of colostrum, decreased colostrum availability due to problems with the dam, and decreased intestinal absorption due to poor gastrointestinal activity or poor mucosal absorptive capacity.<sup>4,9,18</sup> A calf's disease susceptibility is also increased by some of the physiological disturbances mentioned in the paragraphs above. This combination of factors is in part responsible for the increased infectious disease occurrence seen in dystocia-affected calves.<sup>10</sup> Even when the problems discussed above have been properly addressed, special attention should be given to increasing colostrum administration to these calves. It has been demonstrated that hypoxemic and acidotic calves display decreased immunoglobulin absorption but also delayed closure of the absorptive process.<sup>4,9</sup> For this reason, it is worthwhile to supplement colostrum for a prolonged time period.

## Worker Training and Education

Calving management and newborn calf care should be seen as critical elements of a dairy health program. The events that occur on the day of delivery have a profound influence on the health and survival of calves. Optimal management of these events requires good judgment and decision-making, as well as appropriate skills. As dairies get larger, most decisions and activities in the calving management arena are made by paid employees. Higher rates of success require that these em-

ployees are well educated about the process so that they can make good decisions, well-trained in techniques so they can perform tasks appropriately, and provided with good protocols and facilities so that procedures are done properly.

In our experience, when these prerequisites are met, calf losses can be reduced by 50% or more. One difficulty for practicing veterinarians who wish to train dairy workers is assembling the appropriate learning objectives and teaching materials for their audience. We have assembled a set of teaching materials for use by veterinarians on the Integrated Livestock Management website at Colorado State University. This information can be accessed at [www.cvmb.colostate.edu/ILM](http://www.cvmb.colostate.edu/ILM) and found under the heading "Producer Information".

## References

1. Arthur GH, Noakes DE, Pearson H: Dystocia and other disorders associated with parturition. General considerations. Types of dystocia within the species, in *Veterinary Reproduction and Obstetrics*, ed 6. London, Bailliere Tindall, 1989, pp 178-179.
2. Azzum SM, Kinder JE, Nielsen MK, Werth LA, Gregory KE, Cundiff LV, Koch RM: Environmental effects on neonatal mortality of beef calves. *J Anim Sci* 71:282-290, 1993.
3. Bellows RA, Lammoglia MA: Effects of severity of dystocia on cold tolerance and serum concentrations of glucose and cortisol in neonatal beef calves. *Therio* 53:803-813, 2000.
4. Besser TE, Szenci O, Gay CC: Decreased colostral immunoglobulin absorption in calves with postnatal respiratory acidosis. *J Am Vet Med Assoc* 196:1239-1243, 1990.
5. Breazile JE, Vollmer LA, Rice LE: Neonatal adaptation to stress of parturition and dystocia. *Vet Clin North Am Food Anim Pract* 4:481-499, 1988.
6. Carstens GE: Cold thermoregulation in the newborn calf. *Vet Clin North Am Food Anim Pract* 10:69-106, 1994.
7. Cole JB: Genetic evaluation of stillbirth. USDA Animal Improvement Programs Laboratory Research Report SB1. <http://aipl.arsusda.gov/reference/fertility/sb2006.html> 2006.
8. House JK: Perinatal adaptation, asphyxia, and resuscitation, in Smith BP (ed): *Large Animal Internal Medicine*, ed 3. St Louis, Mosby, 2002, pp 266-276.
9. Kersting K: Postpartum care of cow and calf, in Youngquist RS (ed): *Current Therapy in Large Animal Theriogenology*, Philadelphia, WB Saunders Co, 1997, pp 324-329.
10. Lombard JE, Garry FB, Tomlinson SM, Garber LP: Impacts of dystocia on health and survival of dairy calves. *J Dairy Sci* 90:1751-1760, 2007.
11. McDermott JJ, Allen OB, Martin SW, Alves DM: Patterns of stillbirth and dystocia in Ontario cow-calf herds. *Can J Vet Res* 56:47-55, 1992.
12. Meyer CL, Berger PJ, Koehler KJ: Interactions among factors affecting stillbirths in Holstein cattle in the United States. *J Dairy Sci* 83:2657-2663, 2000.
13. Meyer CL, Berger PJ, Koehler KJ, Thompson JR, Sattler CG: Phenotypic trends in incidence of stillbirth for Holsteins in the United States. *J Dairy Sci* 84:515-523, 2001.
14. Odde KG: Survival of the neonatal calf. *Vet Clin North Am Food Anim Pract* 4:501-508, 1988.
15. Schuijt G: Iatrogenic fractures of ribs and vertebrae during delivery in perinatally dying calves: 235 cases (1978-1988). *J Am Vet Med Assoc* 197:1196-1202, 1990.
16. USDA: Dairy 2002 Part I: Reference of Dairy Health and Management in the United States, 2002. USDA:APHIS:VS,CEAH, National Animal Health Monitoring System, Fort Collins, CO, 2002.
17. USDA: Dairy 2002 Part II: Changes in the United States dairy industry, 1991- 2002. USDA:APHIS:VS,CEAH, National Animal Health Monitoring System, Fort Collins, CO, 2003.
18. Vaala WE, House JK, Madigan JE: Initial management and physical examination of the neonate, in Smith BP (ed): *Large Animal Internal Medicine*, ed 3. St Louis, Mosby, 2002, pp 277-293.
19. Wells SJ, Dargatz DA, Ott SL: Factors associated with mortality to 21 days of life in dairy heifers in the United States. *Prev Vet Med* 29:9-19, 1996.
20. Youngquist RS: Parturition and dystocia, in Youngquist RS (ed): *Current Therapy in Large Animal Theriogenology*. Philadelphia, WB Saunders Co, 1997, pp 309-324.