

Revision Date:
David Marshall, VMD
Delaware Equine Extension Veterinarian

Colostrum and its Importance to Young Calves

Health and performance directed growth in the newborn calf are dependent upon a multitude of factors. Some of these factors occur prior to birth, but significant health set-points occur at birth and during the period immediately after birth.

One of the very important management concerns of soon-to-be calving dry cows is the environmental conditions of the calving area. Calves need to be born in a clean, dry, stress-free environment. If soon-to-be calving dry cows are housed in a wet, contaminated environment, and birth is permitted in such an environment, disease challenge to the newborn calf may exceed critically high levels during the first few hours to days of life. Even adequate resistance can be overwhelmed by the poor management disease challenge. Neglectful management is likely to result in risk of navel infection, blood infection (septicemia), joint infections, diarrhea (scours), pneumonia, and death to our calves. Regrettably, if these critically disease challenged calves do survive, some studies indicate these calves do not achieve the adult performance levels of genetically comparable herd mates that were disease free at birth.

Proper calving management and assistance is critical to newborn calf survival and subsequent good health. Any calf born as a result of a prolonged birth or difficult birthing (dystocis) is much more prone to stillbirth, early calf hood mortality, and colostrum deprivation. One of the most important components of a successful dairy replacement program is the early administration of high quality colostrum to the newborn calf. Colostrum management comprises the focus of this paper; but first a concluding word on prolonged birth and difficulty birthing. When calves fail to drink or absorb appropriate levels of colostrum and the protective antibodies that colostrum contain, this disease syndrome is referred to as Failure of Passive Transfer or FPT for short. One of the greatest causes of FPT in dairy calves is calves weak from birthing that are unable to suckle effectively due to prolonged birthing complications or dystocis. All cows birthing require observation and many cows will require calving assistance when observations direct us towards intervention.

In a recent study of 6684 dairy calvings, 37.7% of the deliveries required one, two, or more people assisting the birth with 2.3% of births requiring mechanical calf extractions. Even with the above 6684 well managed assisted calvings, the death rate of calves requiring assistance at birth was 1½ times higher than calves born to non-birth assisted cows.

Take Home Points:

1. All cows require birthing observation and many cows will require birthing assistance.
2. Calves born from cows requiring birthing assistance have a heightened risk of death.

A second question I am frequently asked: When should I help? One must develop a management “feel” for “when to assist” through experience, but there are some guidelines to direct us. Stage one labor in the cow takes 2-6 hours, during which the cow will be somewhat uneasy. This is the stage when the cervix and vagina (birth canal) dilate or expand to permit the calf birth passage. When the head and/or feet enter the vagina (birth canal), it stimulates the abdominal push and straining necessary to expel or push out the calf. The breaking of the water occurs during this stage which is termed second stage labor. Actual delivery will require only ½ hour from this point, but may extend normally up to two hours.

Take Home Message:

Cows require examination and possible assistance if:

1. She has been in first stage labor for 3-6 hours and doesn't start actively straining. I have told my dairy clients 4 hours.
2. She has been in second stage labor (water broke, calf parts show, pushing and straining contractions) for no more than 1 hour with no progress.
3. Water sac or membranes evident for 1 hour with no progress.

The newborn calf (neonate) is born with virtually no immunity or protection from the common disease producing organisms (pathogens) that it will soon encounter in its environment. The protection against these pathogens for our calves to survive and grow is derived solely from colostral immunoglobulins (Ig).

Three factors that will determine the success or failure of a colostrum management program are:

1. Time at which colostrum is administered to the calf following birth.
2. Amount (mass) of colostral immunoglobulin (Ig) fed.
3. Quality of colostrum fed.

A thick, creamy colostrum suggests good quality, but test colostrum to know for sure. Colostrum should have more than 50 grams per liter of Ig – this equates to the “green” reading on a colostrometer. Point for understanding: a liter is slightly larger than a quart, 1 quart = 0.946 liter.

First calf heifers generally have the poorest quality of colostrum. Additionally, if a cow produces more than 18 pounds of colostrum, the odds are less than 50 percent that it will contain sufficient immunoglobulins. Cows with a dry period of less than 45 days often have poor-quality colostrum as well as dry cows on poor nutrition or undergoing heat stress. Lastly, research suggests on the average, Holsteins typically average poorer quality colostrum than other breeds.

Take Home Messages Concerning Colostrum Quality

1. Test colostrum using a colostrometer.
2. Do not feed colostrum from cows testing positive for Johne's disease.
3. Do not feed bloody colostrum or colostrum with bacterial contamination (mastitis) or contaminated with dirt or manure.
4. High-quality colostrum can be refrigerated for 48 hours. Colostrum that is not fed within 2 hours of collection should be refrigerated to control bacterial growth.
5. Never pool colostrum.
6. Colostrum can be frozen in two-quart containers and stored for up to 1 year.
7. Your veterinarian can help you monitor effectiveness of colostrum management by testing calves to determine if passive transfer has occurred. This blood test is done at 2 to 7 days of age and calf managers can easily acquire these skills.

The amount (or mass) of colostrum fed is closely related to the quality of colostrum fed. The colostrometer is one of several methods to measure Ig levels or concentration within raw colostrum. I emphasize the colostrometer because it is simple to use, inexpensive and readily available to dairymen. Our goal is to provide each calf with a mass (a critical mass) of 100 to 200g immunoglobulin to prevent FPT. This critical mass of Ig must be both ingested and absorbed by the newborn calf to acquire passive immunity. Many studies have demonstrated the wide concentration variability of dairy cow colostrum; ranging from as low as 15 grams to as high as 175 grams per liter. Therefore that "green" reading on the colostrometer, which equates to 50 grams of Ig per liter, means we must give 4 quarts (or 4 liters) to achieve our goal of 200g.

Several biological facts will help us understand why the recommendations we make are so time and quality dependant. There are several different types of immunoglobins (Ig) in cow colostrum, IgG, IgM and IgA. IgG is the dominant immunoglobulin found in cow colostrum and it makes up 70-85% of the Ig in colostrum. The immune components in colostrum are not limited to immunoglobins, but other colostrum cells, nonspecific antimicrobial factors and cytokines are functional in combating disease and preventing disease in our newborn calves.

During the first few hours after birth, a very special "window of opportunity" exists for calves to absorb these disease combatants and disease preventers. As the cells in the

calves' intestine mature, they lose their ability to absorb Ig. The Ig's are proteins and the intestine is programmed to degrade proteins into their component amino acids. In the calf, the process of protein breakdown is put on hold for 6-12 hours, and will actually insorb these large Ig proteins directly into the blood. The decline in the efficiency of Ig insorption starts to occur within 1 hour of birth and by 12 hours after birth, enzyme secretion to break down proteins in the calf gut becomes marked. The bottom line is this: we have a very narrow window of opportunity in which to deliver high quality colostrum to our calves before the intestinal tract matures and the ability to absorb Ig is lost.

Take Home Messages Concerning Colostrum Amount (Mass), and Colostrum Timing

1. Remove calves from cow before suckling, within one hour of birth.
2. Feed each calf a high quality colostrum at the rate of 12 to 15 percent of the calves' body weight. For example, a 90 pound calf would need four quarts of colostrum initially at 1 hour; followed by a second feeding of two quarts no more than 10 to 12 hours post birth.
3. Feed colostrum within 1 hour of birth.
4. Be meticulous in the sanitation of the esophageal feeder equipment. Use a chlorine solution and hot soapy water for cleaning.
5. Continue to feed the colostrum and transition milk for 2 to 3 days after birth.

Two final remarks upon conclusion. First, what about the use of colostrum replacers or colostrum supplements? These products have been available since the mid 1980's but their dependability compared with fresh, high quality on farm colostrum remains ambiguous. However, there are times when cow colostrum is of poor quality, may be unavailable at the correct feeding time, or is contaminated with disease-causing organisms (example-Johne's). In these situations, colostrum supplements are useful and recommended. Lastly, don't forget to dip the navel of newborn calves as soon after birth as possible. This will inhibit infectious bacteria from entering the open umbilical cord. Dip a second time when you give your calf that second two quart colostrum feeding at 10-12 hours following birth.

Five Concluding Take Home Points

1. Manage cows to deliver a vigorous calf.
2. Manage cows to produce the highest quality of colostrum.
3. Manage soon-to-birth cows to protect calf from newborn diseases.
4. Collect clean colostrum and manage colostrum to keep it clean.
5. Consider and manage colostrum as the most important calf disease prevention tool within several important management tools.

Colostrum Highlights:

- ✱ Sooner is better
- ✱ More is better
- ✱ Lots of Ig antibodies is better