



## **Chapter 9**

# Weaning Methods to Improve Calf Performance

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## Introduction

Weaning is a critical time in the production of beef cattle and decisions about when and how to wean and when to process and transport calves can all affect profitability. Recognizing the effect of weaning management on calf health and performance is key to a successful program. The calf is presented with several types of stress at weaning as it undergoes changes in its feed, environment and social structure and calf health will benefit from minimizing these stresses. Calf health at feedlot entry has carry over effects on feedlot gain as well as carcass quality traits and, therefore, healthy calves at weaning are needed for production of a desirable consumer product.

Without human intervention beef cows generally wean their calves at around seven to 14 months of age (Reinhardt and Reinhardt, 1981). By this time milk production in the cow has already decreased and the calf is grazing or eating solid foods. Toward the end of the suckling period, most suckling activity is initiated by the calf, as the cow has already begun breaking the maternal-offspring bond. In production environments, weaning usually involves a more abrupt separation between dam and offspring than occurs in nature. In addition to the end of suckling and breaking of the bond between mother and offspring, weaning management often includes a change of location and diet to something unfamiliar to the calf. Removal of calves from adults and comingling with unfamiliar animals results in a change in social structure among calves. These combined events can create stresses on the calf that affect health and performance. Good weaning management will recognize these stresses and provide means to minimize their effects on the calf.

Stress increases the level of the hormone cortisol in the blood, which then lowers immune function. This can lead to increased sickness and lowered gain in weaned calves. Abrupt weaning of beef calves has been shown to negatively impact a variety of immunological responses (Hickey et al., 2003), including lowered antibody titers (Blecha et al., 1984) after vaccination. Lowered resistance to disease

## **Key Points**

- Weaning is a stressful period for calves as they change feed, environment and social structure.
- Stress increases blood levels of the stress hormone, cortisol, which can have negative impacts on calf health and performance.
- Methods to minimize stress at weaning, such as fence-line, two stage, or pasture weaning may help to alleviate some of the stresses at weaning.
- Preconditioning calves before marketing, including weaning several weeks before shipping, training calves to use feed bunks and waterers, and a good vaccination program with help calves perform well in the feedlot.
- Early weaning can be used as a management tool to improve reproduction in cows and to manage forage supplies but different management strategies are needed for early weaned calves.
- Good nutritional management and low stress handling techniques are important components of a weaning program.

is especially important if calves will be mixed with new cattle that may have a different disease and vaccination background that could result in exposure to new pathogens.

#### Weaning Methods

Several methods have been tested to ease weaning stress for the calf by breaking the process into steps. Two-step and fenceline weaning attempt to separate the stress associated with the end of nursing from the stress of separating the calf from its mother. Some studies testing these methods have shown decreased stress in calves once they are completely removed from their dams and taken to a new location. However, study results have not been consistent and may differ due to time of separation or to other differences between studies (Enriquez et al., 2011). Also, even though calves may show decreased stress after complete separation from their mothers, calves that are prevented from nursing may be undergoing some stress during the nursing separation period (Enriquez et al., 2010). It may be that these methods create a lower level of stress for a longer time and this may affect their success.

Important signs of behavioral stress include increased vocalization (bawling) during both the pre- and post-separation period, increased walking and standing time, decreased eating and increased aggression (i.e. head-butting). Increased release of stress hormones are related to these behaviors which leads to impacts on immunity and health.

#### 'Two-step' weaning

In this method, a device or 'flap' is placed in the nose of the calf that prevents nursing while still allowing the calf to have direct contact with its mother and to eat solid food. These nose flaps are used for about four days to a week before the cow and calf are physically separated. Several studies have shown this method to result in less stress on the calf than abrupt weaning, as evidenced by behavior, weight gain and stress and immune function indicators (Haley et al., 2005; Siegford et al., 2007; Campistol et al., 2013), although others have reported decreased gains in calves weaned in this manner due to decreased food intake (Boland et al., 2008). Calves exhibit some 'frustration' behavior when they are not able to suckle and calves may stay closer to their mothers during this period than calves without nose flaps (Enriquez et al., 2010), at least for the first few days (Haley et al., 2005). This could be the cause of decreased feed intake and gain shown in some studies. Differences in the success of this method between studies could be related to the type and quality of feeds offered, age at weaning and dam milk production. Calves already consuming a large proportion of their diet as forage (for example, older calves or calves suckling lower milk producing cows) will likely perform better with this method than those relying heavily on milk. This twostep weaning process requires calves to be worked about a week before weaning and labor needs will be greater than other methods.

#### 'Fence-line weaning'

With this weaning method, calves are separated from their dams and placed in a pasture or pen next to their mothers where they can see and hear them, but cannot suckle. Calves can be expected to spend about two to three days close to the fence bawling and pacing but will gradually move away (Enriquez et al., 2010; Price et al., 2003). Studies with fenceline weaning have shown variable results with some reporting increased gain, others decreased gain and others no change in gain. As with two-step weaning, these variable results may be related to different environmental conditions. When using fence-line weaning, the following should be considered (Wright and Pruitt, 2005):

- Fences need to be adequate to keep cows and calves separate and to prevent suckling. Gerrish (1998) has suggested either woven wire or five strands of electric wire for cattle that are not familiar with electric fence. Three strand electric fence many be adequate for cattle familiar with electric fence.
- If calves are to remain on pasture, move the cow-calf pairs to the new pasture for about a week before separation to allow calves to become familiar with water locations and fences.
- The performance of the weaned calves will depend on the quantity and quality of forage available.

Pasture weaning is generally considered to be a low-

stress weaning method (Gerrish, 1988). With this weaning method, calves are placed on pasture after separation from their dams rather than being put in a drylot. Pasture weaning can be combined with two-step weaning, fence-line weaning or may be an abrupt weaning, where calves are moved out of sight and sound of their mothers. Pasture weaning can lower the stress associated with movement to a new location where calves may be unfamiliar with facilities such as feed bunks and water troughs. If possible, place cow-calf pairs into the pasture before weaning so that calves have time to learn about their surroundings. At weaning, move the cows to a new location and allow the calves to stay in the pasture that is familiar to them. Weaning into a clean, dry pasture may prevent the dust that may come with calves walking excessively in a drylot and may help lower susceptibility to respiratory disease.

Calves have relatively high nutritional requirements and pastures used after weaning should be of good quality. Depending on growing conditions, this may be accomplished by grazing the pasture early in the growing season so that there is abundant high quality regrowth by weaning, by grazing hay fields after harvest if climate allows for regrowth or if fields are irrigated, or planting a grass or small grain that will be of good quality at weaning. Depending on forage conditions, calves that are to be left at pasture for a full 45-day preconditioning period may benefit from some supplementation. This may help with both weight gain and training of calves to use feed bunks.

#### Preconditioning

Preconditioning is a process intended to help decrease stress and increase immune function in weaned calves, resulting in decreased respiratory disease. There are well-known benefits to preconditioning in the stocker and feedlot segments of the beef industry as it has been shown to decrease morbidity and mortality, to increase post-weaning gain and to improve carcass quality. A variety of marketing programs exist for preconditioned cattle and entry into these programs requires careful evaluation of the cost and benefits. Over a 25-year period, premiums for preconditioned calves have been shown to be from \$1.43 to \$6.15/cwt (Thrift and Thrift, 2011). Many of the programs involve steps that are good management practices, whether or not you are enrolled in a specific program. These practices should result in improved calf prices through their impact on calf health and performance as they are intended to decrease death and sickness in feedlot cattle and improve carcass quality. Results of long-term studies on the economic value of preconditioned calves are generally favorable (Dhuyvetter et al., 2005; Seeger et al., 2011). The profitability of preconditioning depends on the cost of feed and calf prices so profitability will change depending on the relative value of these two at any time. In a recent review of research studies from the 1980s through 2010, Thrift and Thrift (2011) reported that the range in net profit values for preconditioning ranged from -\$89.92 to \$53.71 per calf. They suggested that the greatest benefits were realized when cow-calf producers had a reputation for providing quality calves and when calves were marketed through special preconditioning sales.

In general, recommended preconditioning practices include:

- Weaning calves at least three weeks before shipment, preferably longer. This will allow time for the calves to overcome the stresses of weaning, to be familiar with use of feed bunks and waterers, to have gained enough weight to offset costs and for immune response to weaning vaccinations to be complete.
- Calves should be trained to eat from a feed bunk and to drink from a water trough.
- Calves should be vaccinated against clostridial and bovine respiratory disease (BRD) pathogens. Vaccination programs should be developed with your veterinarian and, if known, that of the feedlot where cattle will be fed. They should also consider when calves will be shipped relative to weaning time and whether calves will be comingled with unfamiliar cattle. Also work with your veterinarian to make sure that you have treatment protocols worked out ahead of time, just in case you end up with sick calves at weaning. Follow quality assurance guidelines in giving injections.
- Calves should be dehorned and male calves

castrated. This should be completed before calves are about three months of age and should not be included as part of the weaning process.

• Target weight gains of about 1.5 lbs/day during a 45-day preconditioning period. This should provide good nutrition while avoiding putting on excessive fleshing that might be discounted at sale.

Mineral programs are also essential to getting good immune response. Copper and zinc are two elements that are important in immune function and also have a tendency to be at low levels in forage of the Northern Great Plains. Ensuring that calves have access to these minerals for several weeks before vaccination can improve immune response.

#### Age at Weaning

For a spring-calving cow herd, the normal age of weaning is typically in the fall, with mid- to late October being the period that most Northern Great Plains commercial cow-calf producers wean their calves. However, early weaning is an option that will influence calf performance and value, as well as several other cow herd productivity and economic responses. Generally, early weaning can be categorized into two age ranges (Whittier, 1995): very early weaning would be the period before the breeding season (birth to 90 days of age), or early weaning during the breeding season (90 to 160 days of age).

Very early weaning can have tremendous value through improved reproductive performance in cows by removing the suckling response and the nutrient requirement for lactation, but it generally requires intense calf management and few would consider it an opportunity to improve calf performance (Patterson, 2007). Calves in this young age range have immature immune systems that are not adequate for the challenges of exposure to novel infectious pathogens, however, they still carry some passive immunity from their mother's colostrum. They also have underdeveloped digestive tracts, particularly in terms of rumen function, meaning that their ability to extract nutrients from foragebased diets is limited. Work with very-early weaned calves (80 days of age) at the USDA-ARS Fort Keogh Livestock and Range Research Laboratory

(Waterman et al., 2006) indicated significantly less net income from very-early weaned calves relative to normal weaning. However, both cows and forage conditions were good in that study (Waterman et al., 2012). Benefits to very early weaning are more evident for thin young cows (Laster et al., 1973) or under conditions of limited forage supply such as drought.

Early weaning that occurs late in the breeding season has more potential to provide practical benefits relative to calf performance. A multi-year weaning date study was conducted by North Dakota State University (Dickinson Research Extension Center, DREC) and South Dakota State University (Antelope Range Livestock Research Station, SDSU). The project was conducted from 2003 to 2009 at DREC and 2005 to 2010 at Antelope. In both locations, half of the calves were weaned at about 120 or 200 days of age (mid-August or early November). Throughout the years in both locations, all calves had similar weight on the day of early weaning (average of 455 lb at DREC and 388 lb. at Antelope) as would be expected. Only the November weaned calves were available for collecting weight data at weaning in November, and again as expected, they weighed significantly more at weaning (average of 648 lb. at DREC and 551 lb. at Antelope).

We sell on weight in the commercial cattle business, so the gross value of the later weaned calves is obvious. However, net value may not be as obvious. One cost saving is reduced forage utilization in late summer and fall by cows whose calves were weaned early vs. cow-calf pairs. As a part of the NDSU-SDSU study, forage utilization was determined during three years of the study at DREC. Augustweaned cattle were pastured separately from November-weaned cattle. Forage was clipped immediately after August- and November-weaning in all pastures to determine difference in forage utilization between early-weaned, non-lactating cows and November-weaned cow-calf pairs. Forage disappearance was 33 and 53 lb per cow day for August and November-weaned cattle, respectively, which is a 36% saving in forage use resulting from early-weaning. This saving in forage utilization has economic value as a source of forage for other livestock. Because of this forage savings, early

weaning times have been recommended for coping with drought as a way to decrease forage demands in grazing operations.

Calves that are early weaned in the breeding season time frame have the digestive tract development to grow well on backgrounding diets during the late summer and early fall period, providing gains that are competitive with those of calves that remain with the cow until normal weaning. Some studies have indicated that respiratory disease in the feedlot may be lower in calves from early weaning programs (Myers et al., 1999) but in other studies the effect of weaning time on feedlot respiratory disease has been difficult to differentiate from any effects of post-weaning management of the early weaned calves (Arthington et al., 2005). In the NDSU and SDSU study, early-weaned calves actually had slightly greater ADG during the backgrounding phase than November-weaned calves. Determining which weaning time provides the best economic value will depend on the cost of gain for the calves from alternative weaning times. A partial budgeting approach could be used to compare the best combination of calf value vs. cost of feeding among alternative weaning dates.

### Other Weaning Management Considerations

Nutritional management of newly weaned calves. Calves should have ready access to good quality feed and water. As calves deal with the multitude of stresses associated with weaning, it is common for feed and water intake to decline. It is important to ensure that access to feed and water is so easy that likelihood that they will eat and drink will be maximized.

Water is not only an important nutrient that is required in large quantity, but adequate water consumption is important to maintaining body temperature and immune function. Maintaining both body temperature and immune function are important to reducing morbidity and mortality in weaning-stressed calves. Water should be of high quality without microbial contamination or high levels of minerals that could affect palatability or possibly be toxic, such as sulfates that could cause polioencephalomalacia. It is important to ensure that water is readily available to the smallest of the calves. Sometimes small calves cannot reach water sources designed for larger cattle such as mature cows. Setting out extra water tanks in pens or pastures with newly weaned calves can increase their likelihood of drinking. Because the calves tend to walk the fencelines, setting these temporary tanks along the fence can be most beneficial.

High-quality hay will be the most likely feed that pen-fed newly-weaned calves will eat because it is the most similar feedstuff to what they have been eating on pasture with the cows. High quality is important so that it will be a good source of nutrition for them, but it also needs to be clean hay so it is palatable and they aren't breathing and consuming dust. It also should be mold free so that it is palatable but also to decrease the chance of mycotoxins. As weaning stress passes and hay consumption normalizes, other ingredients can gradually be added to the ration to ensure it is nutritionally balanced for the performance objective for the calves. Bunk management is very important at this time. Hay should always be available during the weaning period to ensure that calves find it and consume it whenever they encounter the feed bunk. Calves should learn during this time that they can trust that they will find feed in the bunk whenever they want it. Even though feeding management later in the growing and finishing programs may change so that bunks are not always full, developing trust is important in the beginning to ensure daily feed intakes are consistent regardless of the feeding program used later.

**Cattle Handling.** The value of low-stress cattle handling is evident for all cattle (see Chapter 6, Low Stress Handling Basics), but particularly important for calves dealing with all of the other stressors of weaning. Their ability to deal with the stresses of new feeds, environment, and lost maternal influence is dependent on ensuring that other stressors are eliminated. Excitement caused by loud and aggressive interactions with humans will add a level of stress that could make a difference in the ability of their immune systems to protect them from newly encountered infectious agents. Aggressive cattle handling will also slow the rate at which they adapt to new feed and water resources and return

to adequate nutrient consumption, thus reducing performance. Aggressive handling at this time will likely negatively influence their temperament for the remainder of the feeding period. This will increase their flightiness, decrease time spent at the feed bunk, increase the stress associated with future trips through the handling facility for procedures such as implanting, and cause an overall decrease in weight gain, feed efficiency, and cost of gain.

#### Summary

Weaning is likely to be the most stressful time in the lives of beef cattle, with negative implications for both short-term and long-term health and performance. Prolonged elevated weaning stress that leads to increased morbidity and mortality not only affects live animal performance, but will also decrease carcass quality and value. Poor weaning management will ultimately lead to cumulative and substantial decreased economic value of both feeder cattle and replacement breeding heifers. A variety of weaning methods, preconditioning programs, and nutritional management practices can contribute to minimizing weaning stress to overcome these potential issues.

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