

## Livestock Health Series

# Preconditioning Programs for Beef Calves

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### Introduction

Demand for preconditioned feeder calves continues to increase in the beef industry as value-based marketing and information flow expand. The goal of a preconditioning program is to increase the value of weaned calves. Preconditioning programs are implemented around weaning time and are designed to enhance immune system function while minimizing stress.

Potential advantages of preconditioning to the cow-calf producer include developing a reputation for high-quality cattle, adding value to home-raised calves and capturing increased revenue via retained ownership. Producers planning to retain ownership of calves past weaning through a stocker phase may also benefit from implementing preconditioning management practices. Preconditioning requires additional labor, management and expense on the part of the cow-calf producer. It usually consists of weaning calves at least 45 days prior to sale, training calves to eat feed from a bunk and drink from a water trough as well as following an appropriate vaccination program. Preconditioning may also include castrating bull calves and ensuring that horned cattle are dehorned or tipped back to the hairline and fully healed.

### Developing and Implementing a Preconditioning Program

#### Targeting Special Feeder Calf Sales

If a particular preconditioned feeder calf sale is targeted, then it is important to know the program's

requirements to qualify calves for the sale. The requirements may differ among various preconditioned calf sales. Documentation of preconditioning practices may be necessary and may include herd health product or veterinary invoices or receipts, calf weaning records and completed certification forms.

### Calf Ownership and Identification

Preconditioning program guidelines may include ownership requirements. Many preconditioning programs set a minimum length of time that a producer must have owned a set of calves in order for them to qualify for the program. Individual calf identification is a critical part of proper record keeping. Calf identification can be accomplished in several ways. Unique ear tags are a common form of cattle identification. Ear tags may be lost from time to time, so a permanent identification method may be useful. Tattoos and brands are permanent identification methods. Proper identification facilitates record keeping for herd improvement and performance testing programs as well.

### Weaning

Calves should be weaned at least 45 days prior to sale or according to the requirements of the specific preconditioning program. A large amount of stress is associated with weaning. Techniques that minimize or lessen stress during this time may benefit calf health and growth performance. Oklahoma State University reported that sorting and hauling freshly weaned calves to the sale facility the day before the auction can result in increased shrink compared to preconditioned calves or calves weaned

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the day of the sale. Preconditioning calves can minimize shrink and add additional sale weight.

Weaning techniques for preconditioning programs should focus on reducing calf stress. Additional stress results when calves are introduced to unfamiliar surroundings post-weaning. Giving calves access to the weaning area a few days before weaning may be useful. Corrals, drylots or small pastures can serve as calf weaning facilities. These facilities must have good fencing that will prevent nursing. Small lots have the advantage of reducing fence walking or pacing, but dust can become a problem in dry conditions.

Fenceline weaning, where calves remain in sight of and in close proximity to their mothers, may reduce weaning stress. One weaning technique involves initial nose-to-nose contact between cows and calves followed by gradual increases in separation distance by moving electrified wires or tapes further from each side. Training cattle to respect electric fencing prior to weaning can facilitate the weaning process. Fenceline weaning also allows high-quality pastures to be used as weaning facilities in place of dusty drylots. Recent research findings show that fenceline contact with dams at weaning minimizes losses in weight gain in the days following separation. In addition, calves totally and abruptly separated from their dams did not compensate for losses in weight gain even after 10 weeks post-weaning compared to fenceline-weaned calves. Properly weaned calves will be “bawled out” and readily consuming feed and water well before the preconditioning period ends.

### **Feed Bunk and Water Trough Training**

The profitability of a preconditioning program can hinge on calf weight gains during the preconditioning period. Feed costs typically account for a large proportion of preconditioning costs, so productive calf weight gains are needed to recover these costs. During weaning, calves must transition from a milk diet to a forage/concentrate-based diet. Calves exposed to eating from a feed bunk and drinking from a water trough prior to weaning may go on feed faster after weaning. Some calves leave the ranch having never seen a feed bunk or water trough.

Training calves to use a feed bunk or watering trough can be readily accomplished. Remove water until calves fill up on hay. Cattle may drink faster if they can hear the water, so a temporary drip system may be useful. Small troughs that are frequently refilled with cool, clean water may be more attractive to calves during hot weather than larger troughs containing warmer water. Position feed bunks perpendicular to fencelines where calves will find the feed bunks faster when they walk the fence. Feed bunks and water troughs should be highly visible and accessible. Provide adequate bunk space (at least

18 to 24 linear inches per head) to prevent crowding. Calves should have access to clean water and adequate mineral supplement at all times.

An effective nutritional program provides a desirable level of growth performance during the preconditioning period. Feedstuff availability and cost should be considered in developing feed supplementation programs. Economical nutritional programs can often be designed around farm forages with forage testing being critical for determining forage quality and matching a supplementation program to the forage program. Balancing a ration using forage test results helps ensure that calf nutrient needs will be met. County Extension personnel can assist producers in balancing rations and designing supplementation programs that target specified levels of calf gains. Because calf nutrient requirements change with increasing body weight, collecting weights at weaning is valuable for accurately accounting for calf size in nutrient requirement estimates.

### **Castration**

Although bulls typically gain faster than steers, most feeders are not interested in feeding bulls. Utilizing growth implants in steers is a strategy that typically provides similar gains to intact bulls. Castration reduces behavioral problems and prevents unwanted pregnancies where male calves are commingled with heifers in post-weaning production programs. If weaned bull calves are sold, then the cow-calf producer is essentially paying the next owner to castrate the calves via discounts for intact bull calves. According to the 2005 Arkansas Livestock Market Survey, bulls were discounted \$6.27/cwt. on average compared to steers. The USDA NAHMS survey of cow-calf management practices in 2007 revealed that 56.1 percent of operations in the south central United States did not castrate bull calves before they were sold.

Castration becomes increasingly stressful as bulls get older. Younger bulls experience less bleeding, infection and weight gain depression than older bulls. Calves castrated later in life may exhibit an undesirable “staggy” appearance. Seedstock producers may wait until weaning to decide which bull calves to castrate and which to develop as future breeding stock. For commercial cow-calf operators, however, castration of bull calves should be performed as early in a calf’s life as possible. Restraining and handling younger calves is easier than working older, larger bulls. An ideal time to castrate baby bull calves is during the first 36 hours of life. Many producers prefer to wait and castrate large groups of calves at once. In this case, all calves should be castrated at three months of age or less. Times to avoid castration to lessen the risk of infections include during fly season and on cold, wet days when the calf may be lying in mud. Different castration methods are described in Table 1.

**Table 1. Various castration options**

<b>Castration Method</b>	<b>Instruments</b>	<b>Procedure</b>	<b>Advantages</b>	<b>Disadvantages</b>
<b>Surgical</b>	Newberry knife, scalpel, emasculator	Open the skin of the scrotum with large incisions or removal of the bottom 1/3 of the scrotum to promote adequate drainage. Grasp and slowly pull the testicles downward until the spermatic cord muscle separates. Do not “dig” for the testicles. In young calves the testicles may be pulled out until the cord breaks. In older calves, use emasculators to crush the spermatic cord or a dull knife to scrape the cord in a shaving motion. Do not cut the cord or excessive bleeding may occur.	Certainty of complete castration	Not bloodless
				Infections may result if there are problems with drainage or flies (a concern during hot weather). Wound treatment with fly repellent is useful. Release surgically castrated calves to a clean, dry area.
				Slower to perform than banding
<b>Emasculatome</b>	Burdizzo, clamps	Move one testicle to the bottom of the scrotum. Locate the spermatic cord above the testicle, and move it to the side of the scrotum. Place the emasculatome over the cord about 2 inches above the testicle and pinch the spermatic cord through the skin of the scrotum. The instrument should be 1/3 of the way across the width of the scrotum and never across the middle of the scrotum. The cord should snap apart. Hold the instrument with jaws closed for 30 seconds. Double clamping can increase chances for success.	Bloodless	Slow, difficult
			Used for older, larger calves	Sometimes unreliable (stags)
				Emasculatomes will eventually wear out and be ineffective. Do not store an emasculatome in the closed position.
<b>Banding</b>	Elastrators, EZE, Callicrate banders	Place the band on the instrument and press the handles to stretch the band. Hold with the prongs pointed up and close the handles to open the band. Slip the band up and over the scrotum. Make sure both testicles are below the band. Allow the band to close on the neck of the scrotum. Pull the instrument out from under the band. Cut the band off and repeat if not done correctly.	Bloodless	Potential for missed testicles
			Used for older, larger calves	Band may break or not cut off all circulation to testicles.
			Easy to perform, newer banders adjust bands to correct tension levels	Infections (tetanus, clostridials): Tetanus and blackleg shots must be given well in advance of banding to be effective at banding time.

## Dehorning

Cattle buyers often discount calves for the presence of horns. Results from the 2005 Arkansas Livestock Market Survey indicated that polled or dehorned feeder calves sold for an average of \$3.70/cwt. more than horned cattle. Horn-related injuries may occur during shipping as well as in the feedlot and are thus undesirable to cattle feeders.

The 2007 USDA NAHMS survey of cow-calf management practices determined that only 35.8 percent of non-polled calves in the Southeast region of the U.S. were dehorned before being sold compared to

the national average of 48.8 percent and that the average age for dehorning was 119 days. Results of the 2005 National Beef Quality Audit indicated that 22 percent of cattle evaluated on the harvest floor had horns, down from 32.2 percent in 1995.

The simplest way to produce calves without horns is to use a homozygous polled herd sire, but several options are available for removing horns from calves born with them (Table 2). Dehorning methods may differ by animal age and stage of horn development. Horn tissue is formed in specialized cells in a small ring surrounding the horn button. Bloodless dehorning methods attempt to destroy this ring of cells and

**Table 2. Various dehorning options**

Dehorning Method	Procedure	Advantages	Disadvantages
<b>Chemical</b>	Apply caustic paste to horn button at 1 day to 3 weeks of age. Cut hair from around horn button before applying. Applying petroleum jelly around the area of caustic paste application can minimize chemical burns. Keep the calf separated from its dam until the paste has dried.	Works well on young calves	Application of caustic paste before a rain can cause eye injury.
		Bloodless	
<b>Hot iron</b>	Heat irons with fire or electricity. Place hot iron over the horn and hold in place with firm pressure. Twist the iron to evenly distribute heat. Apply long enough (usually 20 seconds) to kill all horn cells around the horn. Look for a copper or bronze color to the skin. Reapply for 10 seconds if copper color is not present.	Used after the horn button appears up to 4 months of age	Must be done when calves are young and horns are small.
		Works best in calves less than 2 months of age with less than 1 inch of horn growth	
		Bloodless	
<b>Tube or spoon dehorners</b>	Cut around the horn and surrounding skin and scoop out.	Works well on very small horns less than 1 1/2 inches long	Not bloodless
		Multiple instrument sizes available	
<b>Barnes dehorners</b>	Select an instrument size large enough to remove the horn and a 1/4- to 1/2-inch circle of skin at the horn base. Press the instrument firmly against the calf's head. Quickly open and twist the handles. Stop any bleeding by cauterizing with a hot iron or pulling arteries with forceps.	May be used on calves up to or slightly past weaning	Not bloodless
		Multiple instrument sizes available	
<b>Saws, wires, keystone dehorners</b>	Remove a 1/2-inch circle of skin along with the horn to prevent regrowth. Stop any bleeding by cauterizing with a hot iron or pulling arteries with forceps. Coagulant powder may be used. Observe the wound for infection for an extended period of time.	For use in older cattle with large horns	Not bloodless
			Exposed sinus may become infected

should be performed prior to significant horn growth. Mechanical dehorning can be performed at any age or animal size; however, stress and complications associated with dehorning may be minimized by dehorning at a young age, preferably at less than one month of age. Mechanical dehorning involves the physical removal of the horn along with a small ring of skin surrounding it.

Sharp, disinfected dehorning instruments are essential when dehorning adult cattle. Because damaged bone tissue may be more susceptible to infection, bone tissue should be cut rather than crushed. Problems with infection are usually not encountered except in cases where cattle have developed a mature horn sinus that leaves an

opening into the sinuses of the head upon dehorning. It is advisable to use disinfectants on dehorning instruments to prevent wound infections and the spread of infectious diseases. Dehorning outside of fly season also reduces the risk of infections developing. Wound treatment with blood coagulant powder and fly spray can be useful.

As with castration, it is important to make sure that calves are properly restrained for physical dehorning. Dehorning requirements for preconditioning programs may involve complete dehorning or only tipping horns back to the hairline. In either case, dehorned calves should be fully healed before shipment.

# Herd Health Aspects of Preconditioning

## Value to the Buyer

Research shows that preconditioned calves have a reduced incidence of health problems post-weaning. Data from the Arkansas Steer Feedout Program and similar programs in surrounding states have demonstrated the dramatic effects that health and medicine costs have on cattle finishing profitability. Results from a nine-year summary of the Arkansas Steer Feedout Program indicated that sickness in the feedlot reduces a calf's ability to grade USDA Choice. This nine-year summary also indicated that 15.7 percent of cattle placements were affected with bovine respiratory disease and estimated associated treatment cost at \$41.55 per animal. In a 2007 survey, APHIS reported that 35 percent of cow-calf operations did not vaccinate calves for respiratory disease prior to sale. Certain buyers are willing to pay premiums for preconditioned calves recognizing that the extra cost of a preconditioned calf may be more than offset by reduced sickness, lower medicine costs, decreased labor requirements, improved performance and enhanced beef product quality. The 2005 Arkansas Livestock Market Survey demonstrated that healthy calves sold for \$33.47/cwt. more than lame calves and \$37.99/cwt. more than sick calves. Severe discounts were also documented for cattle with bad eyes, dead hair or a stale appearance.

## Vaccinations

Vaccine schedules can differ, but two basic strategies are preferred. The first is to vaccinate calves two to four weeks prior to weaning and administer booster injections at weaning. The second schedule allows producers to give the first vaccine at weaning. Then a booster is administered two to four weeks following the initial injection.

It is always important to know the required vaccination protocol and specifications of the particular preconditioning sale that will be targeted. Vaccination requirements for recent preconditioned calf sales in Arkansas have required the following:

1. IBR, BVD, PI<sub>3</sub>, BRSV (a 4- or 5-way viral vaccine)
2. 7-way clostridial vaccine (Blackleg)
3. *Pasteurella haemolytica* (recently renamed *Mannheimia haemolytica*) also containing leukotoxin
4. *Pasteurella multocida*
5. *Haemophilus somnus*

Some of these vaccines can be purchased in combination such as *Haemophilus somnus* and 7-way

clostridial vaccine, as well as *Pasteurella haemolytica* and *Pasteurella multocida*. Many preconditioned calf sales require individual identification and certification of the health and vaccination program by a licensed veterinarian or an Extension agent. If the calves are heifers, they are generally required to be Brucellosis (Bang's) vaccinated.

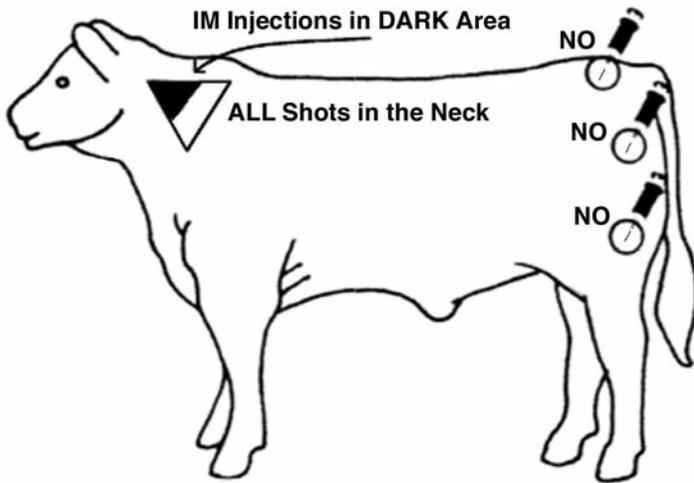
Calves should also be treated with a deworming product. It is ideal to treat for internal and external parasites simultaneously. Many pour-on and injectable products will treat for internal parasites as well as lice, mange mites and horn flies.

## Beef Quality Assurance

In order to give uniformity and consistency to our product, the National Cattlemen's Beef Association has developed a set of guidelines to be followed when administering injections to cattle. The following is a list of recommendations to improve injection-site quality control:

1. Remember to always give subcutaneous (under the skin) and intramuscular injections in the neck area to avoid damaging expensive carcass cuts in the rump, top butt or round areas. Refer to Figure 1.
2. If possible, always use a vaccine that is administered under the skin rather than giving intramuscular injections. When administering products under the skin, use the tenting technique by clasp the animal's hide between the fingers and lifting it away from the body. Then inject the product into the "tent."
3. Only use approved drugs to prevent drug residues.
4. Maintain individual health records or group animal health records when treating or processing (vaccinating) cattle. List what products were used, who administered the products, where they were administered, how much was given, product expiration date, withdrawal period and date of treatment.
5. It is important to read and follow manufacturer's label instructions to ensure that the product is utilized correctly.
6. When administering medication, never give more than 10 cc of product at one injection site.
7. Change needles frequently – every 10 to 15 injections.
8. Always maintain strict adherence to slaughter withdrawal periods.

**Figure 1. Beef Quality Assurance injection location guidelines**



The Arkansas Beef Quality Assurance Program educates producers about meat residue avoidance, injection site problems and other management factors affecting beef quality. Many cattle sales are allowing calves that are produced in a BQA certified herd to capture premium prices. While BQA certification may not be a requirement of some preconditioned sales, it can add value to the calves. The Arkansas BQA Program offers two levels of participation.

**Level 1 – Voluntary Participation:** This level asks producers to participate by reading the Arkansas BQA Handbook and adopting BQA guidelines for their herds. Participation is voluntary and will place the producer on the BQA mailing list for future updates.

**Level 2 – BQA Certification:** This level requires the producer to take the Arkansas BQA Producer Certification Exam and sign the BQA Producer Contract. Upon successful completion of the exam and receipt of a signed contract, a producer will be issued a BQA certification number, a BQA certificate, and a BQA wallet ID card to show at BQA-certified cattle sales.

The Arkansas BQA certification process is voluntary and designed to certify cattle producers instead of individual animals. To find out more about the Arkansas Beef Quality Assurance Program, contact your local county Extension office.

### **Causes of Vaccine Failure**

It is important for the producer to understand that vaccination does not equal immunization. Vaccination is the act of delivering the product to the

animal, while immunization is the animal's development of an immune response to the vaccine. There are three basic categories for vaccine failure: human error, host response and vaccine factors.

Human error is the most common cause of vaccine failure in non-stressed cattle. It is important to always read and follow product label instructions to ensure the correct dosage and the appropriate route of administration. Never mix two products together in the same syringe. If you are using an automatic, "pistol grip" syringe, be vigilant to keep disinfectants out of the barrel of the syringe. Disinfectants can leave residues in the barrel, which break down modified live vaccines and render them sterile. Clean the barrels using water heated to 180 degrees F or higher to kill infectious organisms. Consideration should be given to the proper interval between booster vaccines. Most vaccines recommend a two- to four-week interval between the initial and booster injection. If the frequency between dosing is not followed carefully, the desired response will not be obtained.

Host response can also play a major role in vaccine failure. Poor host response can be due to maternal antibodies found in colostrum, which can neutralize antigens in vaccine. Therefore, young animals (less than 60 days of age) that are given vaccines that their dam was also vaccinated for may not develop the desired immune response. The maternal antibody levels start to decline at two to three months of age. Other factors that affect the host's response are a poor plane of nutrition (including minerals), immunosuppression, concurrent clinical infection or exposure to undue stress (excessive handling, transporting, pregnancy, etc.). A contaminated environment with increased exposure to infectious organisms can also overwhelm the animal's immune system regardless of the vaccine used.

Vaccine factors that lead to vaccination failure are typically due to improper storage of the vaccine. Failure to store vaccine at 40 to 50 degrees F can lead to a breakdown of that vaccine. Vaccine can also be degraded by exposure to ultraviolet light and freezing. When using vaccine at the working chute, be mindful to keep it in an insulated cooler. Do not save vaccine. Only purchase quantities that can be used at one time. Modified live vaccines must be used within one hour after the bottle has been opened.

### **Is Preconditioning Cost-Effective?**

Do the returns from preconditioning exceed the costs associated with the practice? Will appropriate rewards accompany the additional time, labor and

expense that goes into preconditioning a set of calves? The answer may differ from one producer to the next. Many producers have shied away from preconditioning programs based on a perception that the buyer receives most of the benefits and may not adequately compensate the cow-calf producer for the added value. A Colorado State University survey of feedlot managers revealed that they would be willing to pay premiums for several value-added practices should they fit the purchase criterion, including the willingness to pay more for calves managed using a proper vaccination schedule (83.3 percent).

Several Arkansas cattle producers participating in the November 2002 Arkansas Cattlemen's Association Preconditioned Feeder Calf Sale held in Fort Smith, Arkansas, evaluated their costs and returns from preconditioning as part of the Arkansas Beef Improvement Program. A livestock market reporter visited cooperating farms around weaning time to estimate calf values if they had been sold at a local livestock auction. Producers were asked to keep track of the following costs associated with preconditioning: calf death loss, labor, veterinary and other health costs, feed/nutrition costs, pasture costs and any additional costs excluding interest. Since hauling costs would be incurred whether the calves were sold at weaning at a local auction barn or hauled to the Fort Smith preconditioned calf sale, only the differences in mileage between the two possible sale sites (producer's local barn and Fort Smith barn) were used to calculate additional hauling expense.

None of the producers surveyed reported calf death losses (Table 3). Average estimated labor cost per calf was \$6.87. Veterinary costs (including labor) averaged \$17.83 per calf, and other health costs (including vaccine and dewormer costs) averaged \$10.19 per calf. Total preconditioning costs averaged \$67.99 per calf. Nutrition-related costs accounted for \$33.10 of this value or close to half of the cost associated with preconditioning. For a fair comparison of pay weights and sale values, a 6-percent pencil shrink was applied to the estimated calf weaning weights, while a 2-percent pencil shrink was applied to weights at the preconditioned calf sale. Research indicates that newly weaned calves have a higher shrink than preconditioned calves weaned several weeks before sale time. Net returns (profit or loss) was calculated with the following formula:

$$\text{Preconditioning net returns} = \text{returns from preconditioned calf sale} - \text{estimated returns if sold at weaning} - \text{costs associated with preconditioning.}$$

**Table 3. Arkansas Beef Improvement Program calf preconditioning survey results, 2002**

<b>Costs and Returns From Preconditioning</b>	<b>Value Per Calf</b>
<b>Gross returns from preconditioning</b> (returns from preconditioned calf sale – estimated returns if sold at weaning)	<b>\$88.99</b>
Calf death loss (0%)	\$ 0.00
Labor	\$ 6.87
Veterinary (including labor)	\$ 17.83
Other health	\$ 10.19
Hay	\$ 8.88
Concentrate feed	\$ 23.46
Minerals/salt	\$ 0.17
Pasture	\$ 0.59
<b>Total costs associated with preconditioning</b>	<b>\$67.99</b>
<b>Preconditioning net returns</b>	<b>\$21.00</b>

On average, the producers surveyed earned a profit of \$21 per calf from preconditioning. Several common factors were identified for producers with profitable preconditioning programs. First, producers with profitable preconditioning programs were successful in keeping the cost of gain (from weaning to sale date) to a reasonable level while providing a nutritional program that produced calf weight gains exceeding one-half pound per day. A reasonable feed cost of gain should be lower than \$0.50 per pound under most circumstances, and must be lower than break-even feed cost of gain to be profitable. Second, veterinary and other health costs accounted for less than one-half of the total preconditioning costs for these producers. It is important to note that the cost-effectiveness of a preconditioning program may vary according to market and production conditions. A recent study at the University of Florida in which preconditioning was not cost effective determined that weight gains alone may not offset feed and overhead cost. In cases where added returns from weight gains alone do not cover preconditioning costs, calves must return an adequate premium at sale for preconditioning to be profitable.

## Summary

Preconditioned feeder calves should be healthy, adapted to feed and water, castrated, dehorned and ready to start eating and gaining weight upon arrival at the pasture or feedlot. Properly preconditioned

calves may command a premium that more than pays for the cost of the preconditioning program. Under certain conditions, preconditioning may not be cost-effective, however. Management strategies such as dehorning and castrating at a young age instead of near weaning, minimizing weaning stress (getting calves onto feed and water rapidly) and implementing effective and economical nutritional and herd health programs can improve the chances for profitable preconditioning. Although the cost-effectiveness of preconditioning will vary with market fluctuations and input costs, the potential benefits to the cattle buyer remain. It is important to have a good idea of what it costs to precondition a set of calves to assess whether preconditioning is an attractive marketing option.

The keys to a successful preconditioning program include maintaining a reasonable cost of gain and finding a market that is willing to pay for the added value. Limit stress at weaning by effectively managing castration, dehorning and weaning strategies. Develop a nutritional program based around on-farm forage resources targeting a desired rate of gain at a sensible cost. Implement proper vaccination and other herd health management practices. These management techniques can increase calf value and are all vital components of an effective preconditioning program. Contact your local county Extension office for more information on preconditioning or related topics.

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