



Nutrition and Management Considerations for Preconditioning Home Raised Beef Calves

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Receiving and weaning times represent the most stressful periods during a beef animal's life. Taking action to ensure minimal stress during the weaning or receiving period is a critical step to minimize the risk and cost of disease. Management steps taken around the time of weaning to ensure optimum health and performance of cattle is often referred to as preconditioning in the cattle industry. In a small, although growing percentage of cases, some or all of these management steps are executed at the ranch of origin by the cow-calf producer. In many more cases, these management steps are taken after the sale or shipment of the calves by the stocker producer or cattle feeder. Examples of preconditioning management steps include a comprehensive animal health program including vaccinations, deworming, coccidiostat, etc.; balanced nutrition before and after weaning; training calves to eat from a bunk; and a growing or preconditioning period that usually lasts 30 to 45 days.

With a variety of cattle types, feed resources, operation sizes, and environmental conditions, no one nutritional program for receiving cattle can be recommended for all Oklahoma producers. However, research and experience have provided scientists and cattlemen with information that can be used to minimize cattle stress and improve health and weight gain during this critical period.

Preweaning and Weaning Management

Developing a strong immune system in beef calves begins with key management factors that must be acted upon prior to calving. Passive transfer of colostral (first milk) immunoglobulins is vital to short-term health as well as lifetime immune function. For example, in one experiment, calves that did not have adequate blood concentrations of immunoglobulins from the dam's colostrum within 24 hours after birth, were three times as likely to be treated for Bovine

Respiratory Disease during the feedlot phase. Please refer to Selk (OSU Fact Sheet ANSI-3358) for a detailed discussion of factors affecting passive immunity.

Any practice that reduces stress on cattle during the first few days after weaning will reduce the risk of health problems, improve calf weight gains, and minimize wear and tear on facilities and people. Many cattlemen prefer to isolate calves in a corral, drylot, or small grass trap with good fencing during the bawl-out period. It is helpful to familiarize calves with their weaning area by giving them access to it for a few days prior to weaning. If a drylot or corral is used, smaller pens are preferable to reduce fence walking or pacing. Feed bunks and hay or water troughs can be strategically placed along the fence line to discourage fence walking.

If the weaning corral is well designed and solidly constructed, the cows can be allowed adjacent access to the calves. However, the corral must be constructed so that calves cannot reach through the bars to nurse. Another practice that may help, but is not always practical, is to leave the calves in the familiar weaning area and move the cows far enough away so that they cannot hear their calves bawling. Probably the least ideal situation is to move the cows to another pasture where they can hear and see the calves, but do not have close contact. This method can work, but it requires a good fence because cows will be aggressive in their efforts to get back to their calves.

Some producers subscribe to the practice of leaving one or more older cows with the calves, thinking that the presence of at least one adult female will calm the calves. However, this practice has not proven to improve calf health, time spent at the feed bunk, or overall performance in research settings. Another practice that seems to be growing in popularity is one of leaving cows and calves in adjacent pastures, using electric fence on either side of a barbed or woven wire fence to keep the cattle apart. This practice, referred to as fence line weaning, makes it easier to utilize high quality pasture, rather than a dusty drylot. Previous and recent exposure to electric fencing is necessary to train the calves to respect it. Initially cows will graze and rest close to the fence, but gradually begin to graze farther and farther away.

During the initial weaning period, a concentrate-feeding program should be implemented. This practice trains the cattle to come to feed, eat from a bunk, aids in health monitoring and handling, and provides a method to incorporate supplemental nutrients in the diet. A minimum of 14 days of

concentrate feeding is recommended to ensure that all the cattle have been trained to eat from the bunk.

Deworming

Many forage systems in Oklahoma are favorable for the proliferation of internal and external parasites. In contrast to adult cattle, calves do not acquire full immunity to gastrointestinal parasites until about a year after they are weaned, thus weaned calves are very susceptible to internal parasites (worms). Cattle infected with internal parasites will have reduced appetites and suppressed immune function as well as reduced ability to respond to vaccination. Producers should consult their veterinarians for assistance in identifying the most appropriate product to use for their area and current conditions. In general, a broad-spectrum endectocide that is effective against inhibited *O. ostertagia* (brown stomach worm) should be used. *O. ostertagia* is thought to be one of the most damaging and frequently occurring parasites affecting beef cattle. Ivomec[®], Valbazen[®], Synanthic[®], Cydectin[®], Dectomax[®], Eprinex[®], or SafeGuard[®] (at the 2X rate) are appropriate for mid-summer deworming to control *O. ostertagia*.

Many preconditioning programs that require certification include deworming as one of the health management requirements. In these programs, producers usually have the option of deworming calves two to six weeks prior to weaning, at weaning, or two to three weeks after weaning. Deworming at the earliest possible date within the program's guidelines will ensure that weight gain is not limited by parasite infestation and digestive tract damage. Additionally, the early application should improve the efficacy of the vaccine products used. In effect, applying the deworming product as early as possible (preferably two to six weeks prior to weaning) should improve the efficiency, profitability, and effectiveness of the entire preconditioning effort.

Implanting

Few, if any, beef cattle management practices are more cost effective or have a higher return on investment than properly used growth promoting implants. These implants are pellets that are implanted just under the skin, on the backside of the ear of growing calves. The pellets release extremely low concentrations of various hormones or hormone-like substances that improve average daily gain 7 percent to 17 percent and feed efficiency 4 percent to 12 percent.

Stocker producers and feedyards prefer that calves do not have an active implant present when calves arrive at their operation. This allows the stocker producers or cattle feeders to uniformly initiate their own implant strategy and minimize problems associated with overlapping implants. These problems can include a higher incidence of buller steers, advanced carcass maturity, and lower quality grade. Implants approved for suckling calves generally have an active payout period of 70 to 90 days. Therefore, cattlemen who wish to participate in certified preconditioning programs requiring a minimum of a 45-day weaning period should:

- Consider implanting their steers and heifers that will NOT be retained as replacements at branding time (45 to 90 days of age)
- Reimplant (if implanted at branding) or initially implant steers destined for the certified preconditioning program during the two to six week window prior to weaning

- If calves cannot be implanted during the two to six week window prior to weaning, they should not be implanted at all, other than at branding
- If there is any possibility that heifers could be purchased or retained for replacements, they should not be implanted more than one time under any circumstance

Implant products cleared for use in suckling calves include; Ralgro[®], Synovex C[®], Component E-C[®], Encore[®], and Compudose[®].

Post-weaning Preconditioning Nutrition

Since the nutrition program can make up 50 percent to 70 percent of the preconditioning budget, careful consideration, planning, and preparation are warranted. Several nutritional management options are available for weaning and preconditioning calves, and they vary considerably within regions of the state. In selecting an effective program, producers should first define and prioritize the objectives of the nutritional management program. Objectives might include:

- Optimizing condition and health of the cattle for the next phase
- Producing added weight gain at a low cost
- Marketing home raised feed resources through the preconditioning program
- Minimizing the risk of digestive disorders and disease during the weaning and preconditioning phase
- Achieving a specific target weight for the cattle by sale or shipping date
- Accomplishing the above objectives in a way that requires minimal labor and equipment investment

Producers must be cautious not to over-condition cattle that might be destined for a moderate to low plane of nutrition, such as dry wintering on native pasture or hay with minimal supplementation. Much of the weight and condition (flesh) gained during preconditioning will be lost, resulting in poor overall production efficiency. Cattle buyers with orders for cattle to go to this type of situation will not be interested in paying very much for fleshy calves that have been fed to gain more than 2 lbs per day. However, if the cattle are more likely to go directly to high quality pasture or to a feed yard where a high concentrate ration is fed, a higher rate of gain, and increased fleshiness is justified.

Preconditioning feeds must be highly palatable. Remember that freshly weaned calves will be more concerned about the absence of their mothers than eating hay or processed feeds. Consequently, feed intake will be low for three to four days, especially if the calves had not been previously exposed to feed in bunks or creep feeders. Providing highly palatable and/or familiar feeds serves to minimize the length of this fasting period resulting in improved weight gain and reduced stress during the first week after weaning.

Actual weight gain is difficult to predict accurately because it can be influenced by many factors. Some of the major factors determining weight gain during this period are listed as follows:

1. Health of the calves during weaning and preconditioning. Sick or parasite-infested calves obviously will not gain well.

2. How quickly after weaning the calves increase their feed intake.
3. The amount of feed or forage consumed.
4. The energy level of the total diet, assuming that protein, minerals, and vitamin requirements are met to sustain the energy allowable gain.
5. The presence of growth promoting implants and/or other feed additives.
6. Length of the feeding period.
7. Previous level of nutrition, such as cows' milk production and preweaning pasture conditions, and the resulting flesh condition of the calves. Fleishy calves generally do not gain as rapidly as thin to moderately fleshed calves.
8. Genetic potential for growth, which is inherited from the calves' sire and dam.
9. Weighing conditions and gut fill. Since young calves can consume between 0 percent and 4 percent of their body weight, unequal fill conditions from one weigh date to the next can cause weight swings of up to 20 to 30 lbs during short time periods.

Grazing Programs and Supplements

In many cases, the cheapest and most convenient preconditioning nutrition program is to turn calves back out on high quality pasture four to seven days after they have been weaned. The pasture should be within easy access to a corral and chute where any sick calves can be restrained for treatment if necessary. Forage quality and availability will vary dramatically depending on species, growing conditions, previous grazing management, and time of the year.

The calves should be given access to the highest quality pasture available. Ensuring high quality pasture at the time of weaning requires considerable planning and pasture management months ahead of time. An excellent method to ensure the highest quality pasture possible is to utilize the rotational grazing technique. For the purpose of this discussion, rotational grazing will simply serve to stage an area for the calves to graze that represents immature (high quality) forage or forage regrowth. A second approach is to stage the production of high quality forage to match the timing of the preconditioning period. For example, if calves are to be sold in a special auction during late October, calves could be weaned in early September and turned out on native pasture until adequate stockpiled Bermudagrass or fescue is available. Another example would be to turn calves out on stockpiled Bermudagrass in mid-October followed by a move to an over-seeded rye pasture in mid-November.

Access to Water and Feed

There is varying opinion among producers as to whether cattle should have access to water, feed or hay, or both upon weaning or receiving. A Texas Tech study showed that when long-haul cattle (720 miles, 6.6 percent shrink) were deprived of water for six to eight hours after arrival, but were immediately offered feed, feed intake was reduced during the first week. There is no evidence to support any advantage in withholding either water or feed from cattle upon arrival. The water source should be fresh, clean, and easily located by the cattle. Many cattlemen prefer to place good quality grass hay in bunks for the first 24 hours after arrival before offering the receiving diet.

Feeding and Bunk Management

Newly received or weaned cattle should be fed at approximately the same time each day in order to establish a consistent eating time. As a result, sickness is much easier to detect because sick cattle are slower to come to the feed bunk. Twice-a-day feedings during the first one to two weeks may be advisable for young, lightweight, or highly stressed cattle. Bunks should be kept clean of manure, stale feed, and silage trash.

Feed Intake

After a period of water and feed removal, which often occurs during weaning and shipping, rumen fermentation is greatly reduced and remains low for several days after cattle are put back on feed. These changes lead to decreased appetite and feed intake. Calves that remain healthy often return to a normal appetite and steady feed intake within two weeks after arrival. However, when calves are sick upon arrival or develop a respiratory disease after arrival, feed intake is reduced further, and the length of time for an animal to return to normal is extended, as shown in Table 1.

A wide range in crude protein and energy concentration is indicated in Table 2 because the level of these nutrients largely depends on animal weight, level of stress, expected feed intake, and desired weight gain.

Receiving Diet Nutrient Concentration

With dry matter intake low during the weaning or receiving period, preconditioning rations should be designed to maximize intake and provide greater concentrations of required nutrients. Refer to Table 2 for current nutrient recommendations for receiving rations intended for highly stressed calves.

Protein Source

The protein in receiving diets should be from a plant protein source, such as soybean meal, cottonseed meal, alfalfa, or wheat middlings. Stressed calves have a lower tolerance for nonprotein nitrogen (urea) than do nonstressed calves. Nonprotein nitrogen is not recommended in receiving diets for cattle weighing less than 600 lbs, and certainly should not be used in diets for calves weighing less than 350 lbs.

Feed Additives

The occurrence of subclinical coccidiosis during receiving is well known; therefore, all receiving rations should contain a coccidiostat. Coccidiosis appears to play a role in the immune response, and coccidiostats have been shown to improve feed efficiency and rate of gain during the receiving period. Feed additives approved for aiding in the prevention of coccidiosis include decoquinate (Deccox[®]), lasalocid (Bovatec[®]), and mo-

Table 1. Dry matter feed intake of newly arrived calves (% of body weight).

<i>Days from receiving</i>	<i>Healthy</i>	<i>Sick</i>
0 to 7	1.55	0.90
8 to 14	1.90	1.43
15 to 28	2.71	1.84
29 to 56	3.03	2.68

Source: Hutcherson and Cole.

Table 2. Suggested dietary nutrient concentrations for stressed calves (dry matter basis).

<i>Nutrient</i>	<i>Unit</i>	<i>Suggested Range</i>
Dry matter	%	80-90
Crude protein	%	12.5-17
Net energy for maintenance	Mcal/lb	0.6-0.85
Net energy for gain	Mcal/lb	0.35-0.55
Calcium	%	0.6-0.8
Phosphorus	%	0.4-0.5
Potassium	%	1.2-1.4
Magnesium	%	0.2-0.3
Sodium	%	0.2-0.3
Copper	ppm	10-15
Iron	ppm	100-200
Manganese	ppm	40-70
Zinc	ppm	75-100
Cobalt	ppm	0.1-0.2
Selenium	ppm	0.1-0.2
Iodine	ppm	0.3-0.6
Vitamin A	IU/lb	2,000-3,000
Vitamin E	IU/lb	20-50

Source: Adapted from National Research Council, Nutrient Requirements of Beef Cattle.

nensin (Rumensin®). A further method to control coccidiosis is to treat the water source with amprolium. A veterinarian should be consulted to determine the most effective coccidiostat in your program.

Research at several locations has shown that adding vitamin E to receiving diets can improve gain and may reduce sickness. Vitamin E should be fed between 400 IU and 500 IU/hd/day during the receiving and starting period. In general, responses to vitamin E additions in the diet have been positive. However, injections of vitamin E at processing have often been noneffective and even detrimental.

Light Calves

Calves weaned early, 6 to 16 weeks of age, and those weighing less than 350 lbs require nutrient-dense diets. Calves cannot efficiently digest moderate- and low-quality roughage. As a result, receiving diets for young, light calves should be highly palatable and higher in protein and digestible carbohydrates than receiving diets for calves weighing over 350 lbs. Programs utilizing free-choice hay as the major ingredient will not be as effective as mixed rations that are higher in concentrates. Young calves do not seem to be as prone to acidosis as yearlings, and according to New Mexico research (Lofgreen and Kirksey), preer concentrate to roughage when stressed and sick.

Two suggested receiving diets for very young calves are shown in Table 3. These diets were developed for the purpose of early weaning, 6 to 8 weeks old, and have proven to be extremely palatable to newly received calves. Diet A has the advantage of requiring fewer commodities and no alfalfa pellets. However, Diet B is less bulky, resulting in better handling characteristics, and should flow better in self-feeders. These diets can be blended as shown; or soybean meal,

minerals, and additives can be pelleted before being mixed with the cottonseed hulls, alfalfa pellets, and corn. Pelleting the supplement improves the physical characteristics of the diet and may help to stimulate intake. Cottonseed hulls are an effective fiber source and appetite stimulant. Because of their low nutrient value and relatively high cost, however, cottonseed hulls are hard to justify in most diets. Even so, cottonseed hulls are very palatable to cattle, and calves will often consume unfamiliar feeds more readily when cottonseed hulls are added.

The protein and energy content of these diets is much higher than would be required in yearling programs. However, these levels are necessary for small calves with high protein and energy needs, but with a relatively low feed intake. Consumption of the diets shown in Table 3 should be 3 percent of body weight within two weeks, and calves should gain between 1.75 lbs and 2.25 lbs per day.

Both diets shown in Table 3 are intended to be fed as complete rations. Other roughage sources should not be provided. If hay is offered, some calves may only consume hay. The result is a nutrient-deficient diet. Energy deficiency in lightweight calves can severely depress the immune system and increase the incidence of sickness.

Calves Weaned at Normal Age

For calves weaned at 6 to 8 months of age or weighing over 350 lbs, receiving programs based on either roughage

Table 3. Suggested diets for receiving very light calves or early weaning.

<i>Ingredient</i>	<i>Diet A</i>		<i>Diet B</i>	
	% of diet, as-fed			
Cottonseed hulls	29.0		14.9	
Alfalfa pellets	-		15.0	
Rolled corn	46.0		46.0	
Cane molasses	4.0		4.7	
Soybean meal (47%)	18.5		17.7	
Calcium carbonate	1.2		0.8	
Dicalcium phosphate	0.5		0.5	
Salt	0.3		0.3	
Magnesium oxide	0.1		0.1	
Zinc oxide	0.008		0.008	
Vitamin A	2500 IU/lb		2500 IU/lb	
Vitamin E	40 IU/lb		40 IU/lb	
Coccidiostat	As per veterinarian's preference			
	Nutrient Content (DM basis)			
Dry matter, %	88.7		88.5	
NEm, Mcal/lb	0.82		0.84	
NEg, Mcal/lb	0.48		0.50	
Crude protein, %	16.0		17.5	
Potassium, %	1.24		1.3	
Calcium, %	0.80		0.82	
Phosphorus, %	0.40		0.43	

Table 4. Performance of calves received 28 days on alternative feed programs.

	75% Concentrate Ration			
	Alfalfa hay, 1st week only	Native hay, 1st week only	Native hay, 4 weeks	40% Protein supplement + Native hay 4 weeks
No. of calves	31	31	31	32
Treated, %	26	23	32	16
Days treated	3.5	4.1	4.0	4.4
Milled feed or supp intake, lbs	9.7	10.4	9.5	1.93
Hay, intake, lbs	1.5	1.1	3.5	8.83
Daily gain, lbs	1.85	1.94	2.01	1.23
Feed:Gain	6.04	5.95	6.44	8.75

Source: Lofgreen and Kirksey.

diets or high concentrate diets can be effective. The decision as to which nutritional program to use will often depend on the availability of resources on the farm or ranch and the advantages and disadvantages of the programs.

There is an apparent trade-off between rate and efficiency of weight gain and sickness in concentrate- versus roughage-based receiving programs. Research from New Mexico (Lofgreen and Kirksey) indicates that weight gain and feed efficiency is improved, but incidence of sickness is slightly increased with receiving diets containing high concentrate, 75 percent, in comparison to a prairie hay diet supplemented with a high-protein pellet as shown in Table 4. Other research has shown a trend of increased sickness as concentrate in the diet is increased from 25 percent to 75 percent of diet dry matter.

Concentrate diets that are moderate to low in starch content and formulated with highly digestible fiber sources, such as distillers grains, wheat middlings, and soybean hulls, may reduce the incidence of sickness as well as the risk of acidosis. At the same time, rate and efficiency of gain should be similar to that of receiving diets based on grain.

Table 5 includes three suggested weaning or receiving diets for calves and yearlings weighing 400 lbs or more. All of these diets use cottonseed hulls as the fiber source or scratch factor, which is important in stimulating rumen motility and reducing acidosis. As mentioned before, cottonseed hulls do not contribute a great deal from a nutrient standpoint, but are very palatable to cattle and can be justified during the critical receiving period. Diet C in Table 5 is a more traditional mix based on corn and alfalfa pellets and has been used in Oklahoma for several years with success. Diets D and E are based on the palatable byproduct feeds of corn distillers grains, wheat middlings, and soybean hulls, respectively.

Such feeds provide a greater proportion of digestible fiber with moderate to low starch content. These formulations may also provide an opportunity to cut costs when byproduct feeds are under priced relative to other commodities.

For Diets C and E, a supplement pellet can be made from soybean meal, minerals, vitamins, and additives. If a supplement is desired for Diet D, a portion of corn can be mixed with

Table 5. Receiving rations for 400- to 600-lb calves.

Ingredient	Diet C	Diet D	Diet E
	% in Ration (as-fed)		
Cottonseed hulls	14.0	20.0	15.0
Alfalfa pellets	19.0	-	-
Rolled corn	51.0	30.5	22.0
Corn distillers grains	-	43.0	-
Wheat middlings	-	-	25.0
Soybean hulls	-	-	25.0
Cane molasses	4.2	4.5	4.5
Soybean meal (47%)	10.3	-	7.5
Calcium carbonate	0.6	1.2	1.0
Dicalcium phosphate	0.6	-	-
Potassium chloride	-	0.5	-
Salt	0.25	0.25	0.25
Magnesium oxide	0.1	0.1	-
Zinc oxide	0.008	0.008	0.006
Vitamin A	2500 IU/lb	2500 IU/lb	2500 IU/lb
Vitamin E	40 IU/lb	40 IU/lb	40 IU/lb
Coccidiostat	As per veterinarian's preference		
	Nutrient Content (DM basis)		
Dry matter, %	88.5	90.0	89.0
NEm, Mcal/lb.	0.83	0.87	0.83
NEg, Mcal/lb.	0.49	0.54	0.51
Crude protein, %	14.5	14.8	14.5
Potassium, %	1.22	1.2	1.18
Calcium, %	0.79	0.66	0.71
Phosphorus, %	0.42	0.42	0.45

the minerals, vitamins, and additives. Because corn does not make a good quality pellet, this supplement should be mixed and blended as a meal with the remaining ingredients of the diet.

Roughage-based programs often require more labor and covered storage space, as in the case of small square bales. However, if an abundance of high-quality hay is produced on

Table 6. 40% protein pellet for receiving programs with hay.

Ingredients	Percent (as-fed)
Soybean meal	88.9
Salt	3.0
Premix ^a	0.18
Vitamin A-30,000 IU/gm ^b	0.11
Vitamin E-222,800 IU/lb ^c	0.089
Cottonseed Meal	5.0
Dicalcium PO ₄	2.75

a To provide desired dosages of decoquinat, lasalocid, or monensin.

b To provide 15,000 IU vitamin A/lb.

c To provide 200 IU vitamin E/lb.

Source: Gill, D.R., and R.A. Smith.

the farm or ranch, producers often prefer a hay-based receiving program rather than purchasing expensive concentrate feeds. Weight gain will be considerably lower compared to concentrate programs; however, added gain during receiving, resulting from a high concentrate receiving program, is often lost before the end of a low-input dry winter grazing program. Conversely, if cattle are to be placed on high-quality pasture or enter the finishing phase immediately after the receiving period, higher rates of gain during receiving may be apparent. In situations where 0.5 to 1.5 lbs per day gain during the receiving period is acceptable, high-quality grass hay, which is clean, palatable, and free of mold, plus 2 lbs of a high protein supplement has worked well in research trials and for many producers. The supplement should contain the necessary protein, minerals, vitamins, and feed additives needed to meet the recommended nutrient levels indicated in Table 2. Research and producer experience indicate that although this receiving program does not promote rapid gain, it does minimize health and digestive disorders. A high protein supplement that has worked well with native hay receiving programs in Oklahoma is shown in Table 6.

Conclusion

It is important for producers to help reduce cattle stress during both the weaning phase and the receiving phase. Taking action to ensure minimal stress during the weaning or receiving period is a critical step to minimize the risk and cost of disease. A good preconditioning program will allow for

the optimum health and performance of cattle. Because the usefulness of a program depends on the individual operation, producers should use the information presented here to develop a specific preconditioning plan that will likely be beneficial to their businesses.

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