



# Nutrition and Management Considerations for Preconditioning Home Raised Beef Calves

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Studies show that preconditioning calves at the home ranch can improve profitability during the finishing phase by \$56 to \$60 per head (Cravey, 1996). In this research, preconditioning included a minimum of a 45-day weaning period combined with a comprehensive vaccination, management, and nutrition program. The increased profitability for preconditioned calves was due to reduced sickness, medicine costs, labor requirements, and improved performance. In Oklahoma, a minimum of a 45-day weaning period is recommended to maximize the benefits of preconditioning (Lalman and Smith, 2001). A balanced nutrition program during this period is critical to ensure profitability for the cow/calf producer and maximum immune system function during the stressful weaning period and later production phases.

Oklahoma cattle operations vary in resources, forage species, and management systems. Consequently, one preconditioning management and nutrition program cannot be prescribed. General management considerations and several specific nutritional program options are suggested in this publication. Additionally, software decision tools are available through the OSU Animal Science web site at <http://www.ansi.okstate.edu/exten/index.html>. PRECON2001 estimates costs of preconditioning. It estimates returns and breakeven sale prices for cattle that will be sold. OSUNRCAF is a simple ration-balancing program designed to assist cattlemen in evaluating rations for growing calves. Both of these programs are Microsoft Excel templates, very user friendly, and free.

## Preweaning and Weaning Management

A strong immune system in beef calves begins with key management practices prior to calving. Passive transfer of colostral (first milk) immunoglobulins is vital to short-term health as well as lifetime immune function (Selk, 1995). 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

(Wittum and Perino, 1995). Readers are referred to Selk (1995; 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, reduces the risk of health problems, improves calf weight gains, and minimizes wear and tear on facilities and people. Calves should be isolated in a corral, drylot, or small grass pasture with good fencing during the ball-out period. Preferably calves should have access to the weaning area 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, 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 stay adjacent to the calves. The corral must be constructed so that calves cannot reach through the bars to nurse. Another practice that may help is leaving the calves in a familiar weaning area and moving the cows far away so they cannot hear calves bawling. The least ideal situation is to move the cows to another pasture where they hear and see the calves, but don't have close contact. This method can work, but requires a good fence because cows will be aggressive in their efforts to get back to their calves.

Some cattlemen leave older cows with the calves, thinking that the presence of at least one adult female will calm the calves. This practice has not improved calf health, time spent at the feed bunk, or overall performance in research settings (Gibb et al., 2000).

Another practice that seems to be growing in popularity is leaving cows and calves in adjacent pastures "nose to nose," using electric fence on either side of a barbed or woven wire fence to separate the cattle. This practice makes it easier to utilize high quality pasture rather than a dusty drylot with hay. Previous (and recent) exposure to electric fencing trains 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 eat from a bunk, aides in health monitoring and handling, and provides a method to incorporate supplemental nutrients in the diet.

## Deworming

Many forage systems in Oklahoma are favorable for the reproduction of internal and external parasites. In contrast to adult cattle, calves do not become fully immune to gastrointes-

tinal parasites until a year after weaning. Weaned calves are very susceptible to internal parasites (worms). Cattle infected with internal parasites have reduced appetites, suppressed immune function, and reduced ability to respond to vaccination. Producers should consult their veterinarian 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®, SafeGuard® (at the 2X rate), Double Impact®, or Topline® are appropriate for mid-summer deworming to control inhibited *O. ostertagia*.

Many preconditioning programs requiring certification include deworming as a health management practice. 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 guarantees that weight gain is not limited by parasite infestation and digestive tract damage. The early application should improve the effectiveness of the vaccine products used. 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 beef cattle management practices are more cost effective and have a higher return on investment than properly used growth promoting implants. Implants are pellets that are embedded 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 to 17 %, and feed efficiency 4 to 12 %.

For growth to be enhanced by an implant, cattle nutrition must be sufficient to support the stimulated growth. Implants will not compensate for inadequate nutrition. In nursing calves, the response to implants depends on the cow's milk production, forage quality, and availability of creep feed. For the post-weaning phase of a preconditioning program, implants will not likely be cost effective unless calves are provided adequate nutrition to allow a minimum of 1.5 pounds per day weight gain.

Stocker producers and feedyards prefer that active implants are not 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 effective payout period of 70 to 100 days. Therefore, cattlemen that 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 or implant steers destined for the certified preconditioning program during the two to six week window prior to weaning. Within this window, sooner is better than later.

- If calves can not 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 both suckling steers and heifers include; Ralgro®, Synovex C®, Component E-C®, Calfoid®, and Implus-C®.

## Post-weaning Preconditioning Nutrition

The nutrition program can make up 50 to 70% of the preconditioning budget, careful consideration, planning, and preparation are warranted. Several nutritional management options are available for weaning and preconditioning calves. They vary considerably within regions of the state. Producers should 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.
- Achieve a specific target weight for the cattle by sale or shipping date.
- Accomplish 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 lower level of nutrition, such as dry wintering on native pasture or hay with minimal supplementation. Much of the weight and condition (or 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 pounds per day. However, if the cattle are more likely to go directly to high quality pasture or 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. 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, familiar feed serves to minimize the length of fasting, 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:

- Health of the calves during weaning and preconditioning. Sick or parasite-infested calves obviously will not gain well.
- How quickly after weaning the calves increase their feed intake.
- The amount of feed or forage consumed.
- The energy level of the total diet, assuming that protein, minerals, and vitamin requirements are met to sustain the energy allowable gain.

- The presence of growth promoting implants and (or) other feed additives.
- Length of the feeding period.
- Previous level of nutrition (cows milk production and pre-weaning pasture conditions) and the resulting flesh condition of the calves. Fleshy calves generally do not gain as rapidly as thin to moderately fleshed calves.
- Genetic potential for growth, which is inherited from the calves' sire and dam.
- Weighing conditions and gut fill. Since young calves can consume between 0 and 4% of their body weight, unequal fill conditions from one weigh date to the next can cause weight swings of up to 20 or 30 pounds over short periods of time.

## Grazing Programs and Supplements

In many cases, the cheapest and most convenient pre-conditioning 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 so 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 have access to the highest quality pasture available. High quality pasture at the time of weaning requires considerable planning and pasture management months prior to weaning. The rotational grazing technique helps insure high quality pasture. For the purpose of this discussion, rotational grazing stages an area for the calves to graze that represents forage regrowth. A second approach is to stage the production of high quality forage to match the preconditioning period. For example, if calves were 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 was 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.

### Native pasture and mature bermudagrass pasture.

The Oklahoma Gold and SuperGold supplementation programs were developed for growing cattle grazing abundant native pasture during late summer and early fall. These programs boost weight gain of fall-born calves weaned during mid-summer as well as spring born calves weaned during August, September, or early October. These supplements are provided in relatively small amounts and can be fed daily or on an every-other-day basis. Oklahoma Gold or SuperGold programs would be appropriate for calves grazing mature bermudagrass pasture. Calves grazing mature native grass pasture can be expected to gain faster compared to cattle grazing mature bermudagrass pasture during this time of the year.

The Oklahoma Gold program consists of feeding the equivalent of one pound per head per day of a 37 to 40% all natural protein supplement containing vitamin A, added trace minerals, and one of four feed additive alternatives: Bovatec®, Rumensin®, Gainpro® or chlortetracycline. In seven research trials conducted with late summer native or mature bermudagrass pasture, cattle supplemented 0.9 to 1.2 pounds per day of a similar protein supplement gained an average of 0.37 pounds per day faster than nonsupple-

mented cattle. Additionally, numerous studies indicate that when grazing cattle receive one of these feed additives, the weight gain response ranges from 0.13 to 0.28 pounds per day. Adding an average response of 0.2 to the 0.37 pounds from the protein results in an average increased weight gain of 0.57 pounds per day. The average supplement conversion calculates to 1.8 pounds of feed per pound of added weight gain.

SuperGold feed contains 25% protein and should be fed at the rate of 2.5 pounds per day. Much like Gold, the SuperGold feed product supplies supplemental protein, vitamins, minerals and a feed additive. With this program, weight gains have been improved an average of 0.76 pounds per head per day when cattle graze abundant native grass pastures during late summer or early fall. This is an average supplement conversion efficiency of 3.3 pounds of feed per pound of added weight gain.

Adequate forage is necessary to make Oklahoma Gold or SuperGold programs successful, because they are designed to enhance forage intake and digestion. They are NOT designed to stretch pasture or increase stocking rate. Insuring adequate forage requires consideration of two elements: forage availability and stocking rate. Overgrazing and (or) forcing cattle to consume too much of the standing forage reduces forage intake and reduces diet quality. These factors lead to reduced animal performance and lower response to the supplementation program. If the forage is picked over after active forage growth has ceased, the remaining available forage will be lower quality.

Table 1 shows typical formulations for Oklahoma Gold and SuperGold feeds. SuperGold is the better choice in situations where feed prices are moderate to low, several of the calves in the group weigh less than 400 pounds and a faster rate of gain is necessary to achieve a predetermined market weight. See your local feed dealer regarding the availability of Oklahoma Gold and SuperGold feed products.

**Stockpiled fescue or bermudagrass pasture.** Under good late summer and fall growing conditions, stockpiled bermudagrass and fescue pasture can provide high quality forage for weaned spring-born calves from mid October through November. Please refer to the shaded box for further information on stockpiled fescue or bermudagrass for preconditioning.

**Supplements for calves grazing high quality pasture.** Lush green pasture, such as rye, wheat, early spring forage,

**Table 1. Typical formula for Oklahoma Gold and Oklahoma SuperGold feeds.**

Ingredient	Composition, % (as fed basis)	
	Oklahoma Gold	Oklahoma SuperGold
Cottonseed meal	86.0	17.0
Soybean meal	-	15.0
Wheat middlings	7.0	56.0
Molasses (pellet binder)	4.0	4.0
Vitamin and mineral premix	3.0	3.0
Feed additive	Variable	Variable
Crude protein, % as fed	38.0	25.0
Feeding rate, lbs per day	1.0	2.5

## Stockpiled fescue or bermudagrass for preconditioning calves during fall

### Pasture Preparation

- Manage pastures to remove existing forage by late August (graze, clip or hay).
- Apply 50 - 100 lbs. of N sometime during late August. If a rotational grazing system with a significant legume component is in place, the fertilizer application may not be necessary, or could be reduced.
- Grazing can usually be initiated sometime during October, depending on timing and amount of rainfall.

### Forage Production

- Forage production is extremely variable and is primarily dependent on the timing and amount of rainfall during late August and September.
- Primarily a result of late summer precipitation, fall forage accumulation is greater in Eastern Oklahoma and declines as you move West across the state. As a general rule, forage accumulation can be expected to range from 25 to 50 pounds per pound of nitrogen applied in Eastern Oklahoma, and 0 to 40 pounds per pound of nitrogen in Central and Western Oklahoma.

### Grazing Management

- Graze the pastures to harvest approximately 50% or less of the standing forage. This will insure better weight gains and require only minimal supplementation. Mature cows can graze the remaining forage after the calves have been removed.
- Keep calves in a small grass trap or corral for 4 to 5 days. Check calves frequently and feed a well-formulated preconditioning feed once or twice daily. This will train the calves to come to the bunk. After this initial period, calves can be turned out to the stockpiled pasture and fed a supplement once daily or on an every-other-day basis.
- Calves will consume around 2.75% of their body weight of forage dry matter per day or around 15 pounds for a 550 lb calf. If a pasture has 2000 pounds of standing forage at the beginning of fall grazing, the approximate stocking rate would be:  $(15 \times 40 \text{ days}) / 50\% = 1,200 \text{ lbs standing forage per head}$ .  $2000 \text{ lbs per acre} / 1200 \text{ lbs per head} = 1.67 \text{ head per acre}$ .
- Strip grazing or rotating the cattle through paddocks will improve harvest efficiency, minimize forage waste and more evenly distribute manure throughout the pasture. Rotational or strip grazing would not be expected to improve animal performance.

### Supplementation

- Only minimal supplementation should be required. Stockpiled bermudagrass and fescue generally contains 12 to 16% crude protein through the month of November. Feed two to three pounds of a 12 to 14% protein feed containing supplemental vitamins, minerals and a feed additive such as Bovatec®, Rumensin®, or Gainpro®.
- The feed can be fed every day, or on an every-other-day basis since such a small amount of supplement is required.

or immature and growing stockpiled fescue or bermudagrass contain more protein than is required by the growing calf. Researchers at OSU have developed a supplementation program that is effective for cattle grazing this type of forage. The program is called Oklahoma Green Gold and consists of feeding approximately 2 pounds per head per day of a lower protein feed with added vitamins, minerals, and a feed additive (Table 2). This program was designed specifically with small grain, winter annual pasture in mind and should work similarly for high quality, immature perennial forages.

In four experiments with cattle grazing wheat pasture, this supplementation program improved daily weight gain by 0.42 pounds per day. Supplement conversion efficiency (compared to nonsupplemented controls) averaged 4.7 pounds of feed per pound of added weight gain.

**Table 2. Oklahoma Green Gold formula for cattle grazing high quality, lush pasture<sup>a</sup>**

<i>Ingredient</i>	<i>Composition, % (as fed basis)</i>
Ground milo	62.15
Wheat middlings	21.0
Sugarcane molasses	5.0
Limestone	4.3
Dicalcium phosphate, 21% P	2.55
Magnesium Mica (Smectite)	4.0
Fine Mixing Salt	0.50
Magnesium oxide	0.22
Vitamin and trace-mineral premix	0.10
Vitamin A-30 (30,000 IU per gram)	0.05
Feed additive	Variable

<sup>a</sup>Source: Paisley et al., 1998. To be fed at the rate of two pounds per head per day. Can be fed on an every-other-day basis, depending on label directions of the feed additive used.

## Drylot Growing Programs

High quality pasture alternatives may not be available. In these cases, hay coupled with supplementation or concentrate-feeding programs can be implemented. The number of nutrition program alternatives is virtually unlimited.

Table 3 includes several rations for calves receiving free-choice, high quality grass hay, with a target gain between 1 to 1.7 pounds per day. Separate rations are suggested for hay containing greater than 10% protein and prairie hay, or other warm season grass hays that typically contain between 6 and 10% protein. Lower quality hay (less than 6% protein) is not recommended for preconditioning calves. The producer has the option of providing calcium and phosphorus sources (such as limestone and dicalcium phosphate), micro minerals (such as copper, zinc and selenium), vitamins A and E, and feed additives in the feed or in a free-choice mineral mix. The formulas shown in Table 3 assume that the calcium and phosphorus sources are provided in the feed mix and the other supplemental nutrients and feed additives will be provided through the mineral mix.

Alfalfa hay and corn grain are complimentary from a nutritional perspective. Good quality alfalfa hay contains high levels of degradable protein, calcium, potassium, magnesium, and it is a good source of many of the trace minerals. Feed grains, such as milo and corn, are good sources of energy and

phosphorus. If these feeds are available at reasonable prices, a growing program for calves can be centered on these commodities. A blend of 60% coarsely chopped or long stemmed alfalfa hay and 40% corn grain (cracked or whole shelled) can sustain weight gains ranging from 1.7 to 2.0 pounds per day. Alternatively, if the two ingredients cannot be blended, hay can be fed free choice or in limited amounts; and corn can be fed at 1% of body weight. Table 4 shows the amount of corn and good quality alfalfa hay required to maintain around 1.8 pounds per day gain for moderate frame steer calves ranging from 350 to 650 pounds. If a faster rate of gain is justified, up to 60% grain with 40% high quality alfalfa hay can produce efficient weight gain. As with any concentrate-feeding program, the grain portion of the ration should be introduced at two to three pounds per day and gradually increased to the desired level.

Where higher rates of gain are justified, some cattlemen prefer a ration that is delivered through a self-feeder. Self-fed rations for growing calves generally contain 60 to 80% concentrate feeds and 40 to 20% roughage products, depending on the type of roughage used. Wheat middlings, soybean hulls, and corn gluten feed are considered concentrate products, because they are rapidly digested and contain very little effective fiber.

If the roughage source is not pelleted, the factor that limits the amount included in the ration is usually the ability of the feed to flow through the feeder. On the other hand, if

**Table 4. Corn and alfalfa hay rations for steers gaining two pounds per day at different body weights.**

<i>Weight of cattle</i>	350	450	550	650
Alfalfa hay, lb. as fed <sup>a</sup>	7.5	8.5	9.5	10.5
Whole or cracked corn, lb. as fed	3.5	4.5	5.5	6.5

<sup>a</sup>Nutrient content of hay, dry matter basis; 60% TDN, 22% crude protein, 1.37% calcium, .22% phosphorus

the roughage source is pelleted, the limiting factor is usually cost per unit of energy and (or) protein. Because these rations are highly digestible and because feed intake can be quite variable, there is always the risk of digestive upset, bloat and founder with self-fed rations. Nevertheless, weight gains of 2 to 3 pounds per day are common with feed conversions ranging from 6 to 8 pounds of feed per pound of weight gain. Obviously, feed costs, feeding facilities, fleshiness of the calves at target shipping date and available labor must all be carefully considered when evaluating whether to employ a self-fed ration over another alternative. Table 5 includes three examples of self-fed rations for weaned calves.

**Table 3. Rations for growing calves receiving free-choice high quality grass hay (% as fed).**

<i>Ingredient</i>	<i>Ration Number</i>					
	1	2	3	4	5	6
<b>High Quality Fescue, Bermudagrass, Wheat or Sudan Hay (minimum of 10% protein)</b>						
Commercial feed product, 12 to 14% protein	100					
Wheat middlings		68.0				
Corn or Milo		15.0	81.0		39.0	19.5
Soybean hulls		15.0		87.0		65.0
Wheat					48.0	
Soybean or cottonseed meal			16.0	10.0	10.0	13.0
Limestone		2.0	2.0	1.0	2.0	1.0
Dicalcium phosphate			1.0	2.0	1.0	1.5
Salt/mineral mix	Salt only	Free-choice	Free-choice	Free-choice	Free-choice	Free-choice
<b>High Quality Prairie Hay (minimum of 6% protein)</b>						
Commercial feed product, 16 to 20% protein	100					
Wheat middlings		83.0				
Corn or Milo			69.0		24.0	23.0
Soybean hulls				72.0		45.0
Wheat					48.0	
Soybean or cottonseed meal		15.0	28.0	25.0	25.0	29.0
Limestone <sup>b</sup>		2.0	2.0	1.0	2.0	1.5
Dicalcium phosphate <sup>b</sup>			1.0	2.0	1.0	1.5
Salt/mineral mix <sup>c</sup>	Salt only	Free-choice	Free-choice	Free-choice	Free-choice	Free-choice

<sup>a</sup> Feed ration at the rate of 0.8 to 1.2% of body weight (i.e. 4 to 6 lbs to 500 lb calves).

<sup>b</sup> Limestone and dicalcium phosphate are sources of calcium and phosphorus. If these ingredients are not available, increase the soybean or cottonseed meal by two or three percent, according to the ration used.

<sup>c</sup> Vitamin A can be added to the ration to include a minimum of 5,000 international units (IU) per pound of feed, or it can be supplied through a fresh commercial salt/mineral product. A feed additive, such as Bovatec<sup>®</sup>, Rumensin<sup>®</sup>, Gainpro<sup>®</sup> or chlortetracycline should be provided through the feed or salt/mineral mix.

**Table 5. Self-fed rations for weaning and preconditioning calves (% as fed).**

<i>Ingredient</i>	<i>Ration number</i>		
	<i>7</i>	<i>8</i>	<i>9</i>
Cottonseed hulls <sup>a</sup>	14.0	20.0	15.0
Alfalfa pellets	19.0	-	-
Rolled corn	51.0	30.5	22.0
Corn distiller's 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
Feed additive	Variable depending on product		

<sup>a</sup>Coarsely ground or unground peanut hulls can be substituted for cottonseed hulls. Finely ground peanut hulls should not be used.

## Mineral Nutrition

Mineral imbalances and (or) deficiencies can cause suppressed immune function, reduced performance and other health problems (NRC, 1996). A properly balanced mineral program for the preconditioning period requires consideration of previous cow and calf mineral nutrition, hay or pasture forage mineral concentration and feed or mineral supplement concentration and form. As a general rule, Oklahoma forages do not have severe micro nutrient deficiencies or high levels of mineral antagonists, compared to forage in many other states. Forage mineral concentration is extremely variable and site-specific mineral problems have been identified.

Table 6 shows AVERAGE mineral concentration in four types of forages common to Oklahoma and compares these averages with requirements of growing cattle. This data was summarized from two large data sets and reveals that most forages require salt supplementation as a source of sodium. Native range or prairie hay will usually require phosphorus supplementation, and most grasses common to Oklahoma

are marginal to deficient in levels of copper and zinc. It is apparent that good quality legume based forages require very little if any mineral supplementation with the exception of zinc and salt, depending on the amount of this type of hay provided in the total diet. In addition, fescue forage is deficient in selenium and bermudagrass is marginal. These values represent averages and variations from location to location can be extreme.

Each of these minerals impact immune function. It is recommended that producers make sure that beef cows receive supplemental sources of these elements prior to weaning; and calves should receive adequate copper, zinc, and selenium through the feed or free-choice mineral.

Galyean et al. (1999) concluded that supplemental zinc, copper, selenium, and chromium have altered immune function and decreased respiratory disease morbidity under field conditions in some cases, but the results have been inconsistent. Based on this research, nutritionists should formulate diets for weaned calves to provide adequate minerals in order to correct any known mineral deficiencies. However, fortification beyond compensation for known deficiencies, especially with trace minerals, is not recommended.

In cases where well-formulated commercial feed products supply adequate calcium, phosphorus, copper, selenium, zinc, and vitamins A and E, there is no need to provide anything other than white salt as the salt/mineral mix. Over-feeding either macro or micro minerals can actually REDUCE animal performance and health status. If straight feed commodities or commodity blends will be used with no added micronutrients, use a salt/mineral product containing these nutrients. The most accurate and inexpensive method to deliver the mineral mix is to top dress the proper amount of mineral mix on the feed ration each day and provide salt free-choice.

## Summary

The demand for preconditioned calves continues to grow in the beef industry. Insuring optimum health, cattle performance during the preconditioning, stocker, and feeding phases, and carcass quality begins with nutritional management of the cow before calving and continues through the entire production system. Preweaning and weaning management, postweaning nutrition, grazing programs, supplements, and mineral nutrition are all important in producing "bullet proof" calves. Each of these factors plays an important role in the efficiency and profitability of subsequent production phases.

**Table 6. Average mineral concentration for four forage types and dietary requirements for beef cattle<sup>a</sup>.**

<i>Mineral</i>	<i>Forage Type</i>				<i>Requirement<sup>b</sup></i>
	<i>Alfalfa/Clover</i>	<i>Bermudagrass</i>	<i>Fescue</i>	<i>Native</i>	
Phosphorus, %	0.27	0.21	0.23	0.08	0.15 to 0.3
Sodium, %	0.08	0.04	0.02	0.01	0.06 to 0.08
Iron, ppm	198	114	110	190	50.0
Copper, ppm	12.4	6.3	5.0	5.7	10.0
Zinc, ppm	23	22.4	17.8	22.5	30.0
Selenium, ppm	0.3	0.15	0.09	0.21	0.10
Manganese, ppm	47.6	83.9	122	51.6	20.0

<sup>a</sup>Forage mineral concentration data from Greene et. al., 1998 and Lusby and Selk, 1994.

<sup>b</sup>Source: Nutrient Requirements of Beef Cattle, Seventh Revised Edition, 1996.

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# The Oklahoma Cooperative Extension Service

## *Bringing the University to You!*

The Cooperative Extension Service is the largest, most successful informal educational organization in the world. It is a nationwide system funded and guided by a partnership of federal, state, and local governments that delivers information to help people help themselves through the land-grant university system.

Extension carries out programs in the broad categories of agriculture, natural resources and environment; family and consumer sciences; 4-H and other youth; and community resource development. Extension staff members live and work among the people they serve to help stimulate and educate Americans to plan ahead and cope with their problems.

Some characteristics of the Cooperative Extension system are:

- The federal, state, and local governments cooperatively share in its financial support and program direction.
- It is administered by the land-grant university as designated by the state legislature through an Extension director.
- Extension programs are nonpolitical, objective, and research-based information.
- It provides practical, problem-oriented education for people of all ages. It is designated to take the knowledge of the university to those persons who do not or cannot participate in the formal classroom instruction of the university.
- It utilizes research from university, government, and other sources to help people make their own decisions.
- More than a million volunteers help multiply the impact of the Extension professional staff.
- It dispenses no funds to the public.
- It is not a regulatory agency, but it does inform people of regulations and of their options in meeting them.
- Local programs are developed and carried out in full recognition of national problems and goals.
- The Extension staff educates people through personal contacts, meetings, demonstrations, and the mass media.
- Extension has the built-in flexibility to adjust its programs and subject matter to meet new needs. Activities shift from year to year as citizen groups and Extension workers close to the problems advise changes.

Oklahoma State University, in compliance with Title VI and VII of the Civil Rights Act of 1964, Executive Order 11246 as amended, Title IX of the Education Amendments of 1972, Americans with Disabilities Act of 1990, and other federal laws and regulations, does not discriminate on the basis of race, color, national origin, sex, age, religion, disability, or status as a veteran in any of its policies, practices or procedures. This includes but is not limited to admissions, employment, financial aid, and educational services.

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