

---

# ANIMAL SCIENCE



INFO SERIES: AS-B 268  
THE UNIVERSITY OF TENNESSEE  
AGRICULTURAL EXTENSION SERVICE

---

## **Feeding Programs for Weaning and Preconditioning Calves**

Warren Gill<sup>1</sup>, Clyde Lane<sup>1</sup>, Jim Neel<sup>1</sup>, Aaron Fisher<sup>1</sup> and Todd Steen<sup>2</sup>

<sup>1</sup>University of Tennessee Animal Science Department

<sup>2</sup>Tennessee Farmers Cooperative

### **Introduction**

Feeder calves are the number one Tennessee agricultural commodity, but too many of them are sold directly off the cow without proper conditioning to withstand the stresses experienced during marketing. This results in a significant percentage of sick and/or dead calves. Calves which have been weaned at least 45 days prior to selling are able to better withstand the stress of transportation and handling associated with typical marketing procedures with less sickness and lower death loss. This process of weaning, vaccinating and other associated practices is termed preconditioning.

A number of factors have caused producers to take another look at weaning calves to get them better prepared for marketing stress. One factor is organized marketing alliances to help cattle producers receive value for the effort of weaning and preconditioning. Another factor is the new information about methods and by-products for feeding calves in a weaning/preconditioning program.

One of the most important new pieces of information is that it is now known that certain feedstuffs are especially high in digestible fiber. This makes them complement the forages that make up most preconditioning rations. The term "Friendly Fiber" is often applied to those feeds, such as soybean hulls, wheat middlings, beet pulp and others. These feedstuffs have significant levels of these highly digestible fibers.

Starchy feeds, such as corn, do not complement forage utilization, and may even suppress forage digestion, making them less valuable in weaning rations. There is some evidence that high starch feeds result in more sickness in preconditioning programs.

Since 1999, a series of studies have been conducted at the University of Tennessee Highland Rim Experiment Station to evaluate various weaning aspects. The results of these studies will assist beef producers with their decision of whether to wean their calves prior to marketing.

## **Study 1. Weaning vs. Leaving on Cows**

Ninety-eight winter-born calves, previously maintained on mixed grass pastures plus creep feed, were selected for this study. Fifty-four of the calves were weaned while the balance (n=44) were left on the cows. Weaned calves were fed a commercial blend (Co-op 16% Natural Supplement-Rumensin) at one percent of their body weight plus free choice hay. Weaned calves were administered 7-way clostridial and bovine respiratory disease vaccines in accordance with Southeastern Pride Blue Tag guidelines. Weaned calves were also dewormed and implanted with a growth promotant and gained more than the control (not weaned) calves. The additional gain, 43 pounds per head (57 pounds for steers and 26 pounds for heifers), was obtained because supplemental feed was fed in conjunction with good quality hay. In this study, it cost \$24.22 per head more to treat and feed the weaned calves.

The break-even selling price was \$56.33 (calves in weaning group would have to sell for \$56.33 per cwt. to cover costs associated with weaning). At the date of the study (in 1999) the profit for weaning was \$28.27 dollars per head (not counting labor or other fixed expenses). These calves were not marketed through special program sales, thus the profit figure does not reflect any additional benefits that producers might obtain by participating in a cooperative marketing program.

Weight differences were not apparent until the end of the trial, supporting the recommendation that calves should be weaned for a minimum of 45 days before benefits of weaning are realized. **Take Home Point: Calves can be weaned and successfully preconditioned on commercial Friendly Fiber feeds in Tennessee.** For more information, please visit <http://www.agriculture.utk.edu/ansci>.

## **Study 2. Feed Alternatives for Creep Feeding and Weaning Calves**

Considerable work has been done to show how weaning calves and introducing them to concentrate feeding (bunk-breaking) prior to marketing will greatly improve the survivability and performance of beef calves. Nevertheless, many managers do not wean calves, perhaps because they are uncertain of the correct procedures required to obtain an efficient weaning program.

The study was designed to compare creep/weaning feeds that are either high in starch (corn), high in digestible fiber (soybean hulls) or a blend of the both. The feed formulation is available on the University of Tennessee Animal Science Department Home Page: <http://www.agriculture.utk.edu/ansci>.

Seventy-five calves weighing an average of 427 pounds were divided into three groups. Heifers and steers were evenly distributed among groups. Calves were weaned in a dry lot and provided free-choice hay and were fed the creep ration at 1% of body weight 46 days prior to weaning. Additionally, the same feeds were fed to the same calves for 39 days post-weaning. Calves were weighed every 21 days.

The rations were formulated to have the same crude protein and total digestible nutrients (TDN). Corn gluten feed was kept constant in each formulation (700 pounds per ton).

Gains during both the creep phase and the weaning phase were acceptable

for all treatments (Table 1 and Figure 1). Concentrate feed consumption was not different between treatments in either the creep phase or the weaning phase. In the creep phase, consumption of feed averaged 4.4 pounds per head per day. In the weaning phase, each feed was initially fed at 1.0 percent of body weight per day, but was decreased to 0.75 percent of body weight for the last 17 days because calves were showing signs of becoming over-conditioned (too fat).

Table 1. Beef calf gains in creep phase and weaning phase

Treatment	Creep Phase Total Gain, lbs	Creep Phase ADG, lbs/day	Weaning Phase Total Gain, lbs	Weaning Phase ADG, lb/day
Blend	119 <sup>ab</sup>	2.6 <sup>ab</sup>	123	3.1

  

Treatment	1st Creep	2 Creep	1 Wean	2 wean
Comm	2.2	2.4	3.25	3.25
Hi Fiber	2.3	2.8	3.25	2.75
Hi Starch	2.3	2.2	3.5	3.1

  

High Digestible Fiber	127 <sup>b</sup>	2.8 <sup>b</sup>	119	3.1
High Starch (Corn)	111 <sup>a</sup>	2.4 <sup>a</sup>	130	3.3

<sup>ab</sup>Column means with different superscripts are significantly ( $P < 0.05$ ) different.

Figure 1. Average daily gains and creep and post-wean gains.

Gains on the high digestible fiber formulation were significantly higher than gains on the high starch formulation in the creep phase. The blend was intermediate between the other two. While consumption of feeds was identical over the entire study, it was observed that calves on the high starch ration were slower to consume all the feed in the bunk.

The higher creep gains observed for the highly digestible fiber formulation (and somewhat on the blend) were due to the complementary nature of these feeds

with the available forages from the pasture. High starch blends may be antagonistic to fiber digestion within the rumen of the animal, and likely explains the lower gains observed.

In the weaning phase, the rumen microbes apparently adapted to the starch ration, since there was a numerical gain advantage for the high corn ration (differences were not statistically significant). **Take Home Point: Calves on feeds with highly digestible fiber sources (Friendly Fiber) supplementing high forage tend to do better as long as forage makes up a high percentage of the diet. Calves eventually adapt to corn based formulations, giving acceptable performance.**

### **Study 3. Effect of Body Size and Ration on Gain of Post-weaned Calves**

A total of 141 calves (bulls and steers) were purchased from three Middle Tennessee sale barns over a 14-day period. Once purchased, the calves were shipped to the Highland Rim Experiment Station, Springfield, Tennessee, where they received a commercial receiving ration plus a medium quality grass hay for a minimum of 8 days. Bulls in the group were castrated and all calves received the first round of an immunization program. All steers received the second round of shots 21-days later. On day-0 of the experiment, all steers were weighed and graded either large or medium frame. Large frame (LF) cattle were typical of Continental/English crossbreeds and medium frame (MF) cattle were typical of English crossbreeds.

One hundred twenty-eight steers were randomly assigned to one of two dietary treatments. The treatments consisted of a 14% CP highly digestible fiber (DF) based commercial supplement or a similar feed mixed 50:50 with whole shelled corn (CORN). The high-corn treatment contained an 18% CP base feed to make the diets equal in protein. The steers were fed their respective treatment ration at 1% of initial average pen body weight and had free access to medium quality grass hay. Steers were weighed and split into two growth periods, with period 1 (P1) being days 0-21 and period 2 (P2) being days 22-45. Nine steers were removed from treatment due to illness and/or death (This high death loss made this study very difficult in terms of additional work and expense, but did not apparently affect the gain results).

In addition to performance data, morbidity/mortality rates were calculated for the two frame sizes and the two treatments. The performance data are listed in Table 2. There was no difference in the initial weight between DF and CORN steers, but LF steers started 39 pounds heavier than MF steers. Over the entire 45-day period LF steers gained 0.4 pounds/day more than MF steers. Also, calves on the DF ration gained 0.4 pounds more each day than did calves on the CORN ration.

During P1 and P2, there was no difference in gain between the LF and MF groups. The DF calves gained 0.9 pounds/day more than did CORN calves during P1, but the difference was not seen during P2. This difference was also not observed in the post-weaning phase of study 2 (previous section). By the post-weaning phase, which is similar to P2, the rumen microbes may have adapted to the high starch, corn ration.

Large frame cattle gained more on the DF feed than on CORN feed in the initial period, disproving the old theory that LF cattle need to be pushed onto a high

corn ration as early as possible (it is true they should be allowed to gain as much as possible to allow them to grade at a satisfactory weight, but this can be done without high levels of corn). The group that performed poorest on the high corn feed were the MF cattle.

Table 2. Initial weights, total and period ADG of steers by frame and ration.

	Initial weight (lb)	ADG (lb/d)	P1 ADG (lb/d)	P2 ADG (lb/d)
Large Frame	606 <sup>A</sup>	2.9 <sup>A</sup>	3.4 <sup>A</sup>	2.5 <sup>A</sup>
Medium Frame	567 <sup>B</sup>	2.5 <sup>B</sup>	2.9 <sup>A</sup>	2.0 <sup>A</sup>
Digestible Fiber	590 <sup>A</sup>	2.9 <sup>A</sup>	3.6 <sup>A</sup>	2.3 <sup>A</sup>
Digestible Fiber plus Corn	583 <sup>A</sup>	2.5 <sup>B</sup>	2.7 <sup>B</sup>	2.2 <sup>A</sup>

Column means not sharing the same superscript are different at  $P < 0.05$  0.05..05

The morbidity/mortality rate was higher for LF steers than MF steers, 12.0% vs. 3.1% respectively. There also tended to be a difference between the calves on digestible fiber (4.7%) and high corn (10.4%), but this was not quite statistically significant. This relationship between high starch feeding and sickness has been observed by other researchers.

**Take Home Message: Large frame calves out-gained medium frame calves, but also consumed more supplement and became sicker. Calves on highly digestible fiber feeds gained significantly faster, particularly in the early phase of the feeding period.**

### Recommendations for Supplemental Feeds in a Forage-based Weaning/Preconditioning Program

The following are nutritional guidelines developed based on the preceding trials. These recommendations describe what should go into a supplement for preconditioning calves:

- **The ration should contain at least 13% Crude Protein (CP).** Possibly higher during the first three weeks of the feeding period, or if fed with lower quality hay. Over the entire feeding period, the average CP should be 13%.
- **The ration should contain at least 72% percent Total Digestible Nutrients (TDN).** Again, this is the minimum to sustain desirable gain and may need to be higher with lower quality forages.
- **High digestible fiber feedstuffs should be strongly considered.** Soybean hulls, cottonseed hulls, wheat middlings, beet pulp, citrus pulp and corn gluten feed are common examples of feedstuffs that contain significant amounts of highly digestible fiber. These ingredients complement forages, assuring that the least-expensive part of the calves' diet is efficiently utilized.
- **Limit feeds high in starch during early part of the feeding period.** Corn is the most common source of starch. If corn is fed at more than 0.4 percent of body weight, efficiency of forage usage decreases. If the goal is to achieve inexpensive gains from forage, consider limiting corn at or below 0.5% body weight. (In finishing programs, rapid gains with little or no forage is the goal. This is when corn is most efficient.)
- **Understand and utilize feed additives.** Antibiotics are often added during the initial phase to prevent or minimize problems with respiratory and enteric infections. After the initial stress is over, strongly consider feed additives that improve performance efficiency, such as ionophores (Rumensin, Bovatec, etc.).

- **Mineral fortification may be very important.** Recent evidence has confirmed that a significant proportion of Tennessee forage and cattle are deficient in minerals that are critical to immune system function. Copper, selenium and zinc, for example, all play roles in immunity and are commonly deficient. Adding these to concentrate supplements is desirable. Injectable forms of these minerals are available and are typically more expensive, but may be needed if significant deficiencies are suspected. Free-choice mineral is also used, but consumption variability may make these less desirable.
- **Vitamin fortification also has a role.** Typically, not as critical as minerals, but with stressed calves, added Vitamins A and E and certain B-vitamins, may occasionally be beneficial.

### **A Note on Consumption**

If commercial feeds are utilized, follow label instructions. This is particularly important if the feeds are medicated, because consumption at the indicated rate assures the correct dosage of feed additives is obtained.

As a general rule-of-thumb, supplemental feeds need to be consumed at a minimum of 0.5 percent of body weight (3 lbs for a 600 lb calf) in order to yield measurable results.

The maximum level of concentrate feeding in a forage-based ration is 1.0 percent (6 lbs for a 600 lb calf). At this level, significant gain improvements should be expected with a properly formulated concentrate. In fact, calves should be watched for signs that they are becoming too fat. Calves that are too fleshy may be discounted at marketing.

### **Summary**

Studies conducted at the University of Tennessee have shown that feeder calves can be efficiently and economically weaned and preconditioned using available feeds plus supplement. The use of supplements with highly digestible fiber such as soyhulls, wheat middlings, corn gluten, etc. can improve performance. Data indicate that the preconditioned period should be a minimum of 45 days. Care should be taken to avoid over-conditioning calves.

### **Acknowledgments**

The trials reported in this article were conducted at the Highland Rim Experiment Station, Springfield, Tennessee. The work was made possible through cooperation between Tennessee Livestock Producers, Tennessee Farmers Cooperative and the University of Tennessee. The following companies provided products for the experiments: Fort Dodge, Merial and Schering-Plough.

E12-2015-00-038-01

*A State Partner in the Cooperative Extension System*

The Agricultural Extension Service offers its programs to all eligible persons regardless of race, color, age, national origin, sex or disability and is an Equal Opportunity Employer.

COOPERATIVE EXTENSION WORK IN AGRICULTURE AND HOME ECONOMICS

The University of Tennessee Institute of Agriculture, U.S. Department of Agriculture, and county governments cooperating in furtherance of Acts of May 8 and June 30, 1914.

Agricultural Extension Service

Charles Norman, Dean