



# Beef Tips

March 2012

Department of Animal Sciences & Industry

[www.asi.ksu.edu/beeftips](http://www.asi.ksu.edu/beeftips)

## Upcoming Events

### KSU Cattlemen's Day

March 2, 2012  
Manhattan, KS  
[www.KSUBeef.org](http://www.KSUBeef.org)

### Round Up

March 19, 2012  
Hays, KS  
[www.WKARC.org](http://www.WKARC.org)

### Beef Improvement Federation

April 18-21 2012  
Houston, TX  
[www.beefimprovement.org](http://www.beefimprovement.org)

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## Improving efficiency starts with understanding the measures

*Bob Weaber, cow calf extension specialist*

For commercial beef producers, the implementation of technologies and breeding systems that increase the quality and volume of production and/or reduce input costs is essential to profitability. Efficiency is a term that refers to the proportion of outputs to inputs and is a frequently mentioned goal of beef producers. There are many different 'efficiencies' that affect beef production, especially at the cow-calf level. Some of these efficiencies are observed at the individual animal level and some observed at the system or herd level.

The various efficiencies can be categorized into measures of biological or economic efficiency. Improvement in individual animal efficiency, especially during the post-weaning growing or finishing phases, may or may not improve efficiency at the herd or system level, and may have an undesirable correlated response in traits of cows.

So, why is improvement in feed efficiency important and why does the beef industry focus on it? During the growing and finishing phase of production, a one percent improvement in feed efficiency has the same economic impact as a three percent increase in rate of gain. Assuming 27 million cattle are fed per year and that 34 percent of cattle in the feedlot are calves and 66 percent are yearlings, the beef industry could save over a billion dollars annually by reducing daily feed intake by just 2 pounds per growing animal.

### Different Measures of Efficiency

There are a variety of measures of efficiency discussed and utilized in beef production. Some may or may not be important to cow-calf producers. For improvements in 'efficiency' to positively impact profitability of a cow-calf producer, the efficiency improvement must be

realized prior to the marketing endpoint of progeny. In the following sections a variety of 'efficiency' measures are discussed including their applicability and limitations for improvement in efficiency of the cow herd. These measures or their component traits have been shown to be heritable, so selection for improvement is possible but anticipated to be slow, requiring a decade or more to move the population a meaningful distance.

*Feed Efficiency or Feed Conversion Ratio:* Many cow-calf producers and, certainly cattle feeders, are familiar with the term *feed efficiency* (**FE**; live weight gain per unit of feed consumed) or its reciprocal, *feed conversion ratio* (**FCR**; F:G or pounds of feed per pound of live gain). Both of these measures are most commonly associated with animals during the growing or finishing phases. Both measures are suitable for managerial use during feeding but are poor selection tools.

Their utility is limited in selection due to two issues. First, the measures are ratios of inputs and outputs, so improvement in the ratio can be achieved by changing the numerator, the denominator or both. Therefore breeders don't have control over which parameter in the ratio changes due to selection. Selection tools like an index that consider each input and output separately are more effective. Second, FCR or FE is strongly related to average daily gain (ADG) and composition of gain. Leaner biological types and larger, faster growing animals tend to have better FE and FCR. Selection based on FE or FCR results in larger, later maturing and leaner cows. This type of cow tends to have higher maintenance energy requirements.

*continued...see Improving Efficiency on page 6*

**“You can’t manage what you don’t measure.”**

## Tally Time – It pays to measure inputs

Sandy Johnson, livestock specialist

Tradition is a big part of the entire beef industry which includes how and what cows are fed during the winter. Sometimes producers may be forced to change their traditional ration due to feedstuff availability or cost. Given the nutrient properties of the substitute feed, there may be other considerations than just trading feed A for feed B.

Take for example the producer that had been grinding alfalfa and corn stalks in a 1: 1 ratio and adding some corn for cows in early lactation. If he just replaced the corn with distillers grains and used the same forage mix (Table 1, ration A), his ration cost anywhere from \$0.14 to \$0.60 more per head per day than if he considered other options. Because of the higher protein content of distillers grains compared to corn, much less protein is needed from other sources. A forage mixture of 1 bale of alfalfa to 2 bales of corn stalks provides some savings, but even more savings are realized when both the alfalfa and corn are replaced by distillers grains (ration C).

A producer might tend to think in terms of only changing what he perceived had to be changed (not feeding \$8 corn). However, using opportunity costs to price all of his feedstuffs and calculating a price per pound of energy and protein on a dry matter basis may help him realize other cost savings. Cost to deliver the ration and storage and feeding losses should be part of the evaluation.

In the example, shifting to distillers grains also means a big change in the calcium and phosphorus supplied in the ration. In the examples above for lactating cows, phosphorus requirements are met by the ration alone and are high enough that in some cases another source of calcium is required to

achieve a Ca:P ratio in the 2-3:1 range. Since phosphorus is an expensive nutrient to provide, additional savings can be found for this ration by finding a mineral with a lower phosphorus content.

The producer in this example was feeding baled corn stalks which were put up relatively early as a result of hail damage and were potentially much higher in both energy and protein than the assumed book value corn stalks, but had never been tested. If the feed test was completed and the ration balanced, additional savings may be gained.

Distillers grains provides both protein and energy to the diet and is considered a protein supplement when fed at lower levels and an energy supplement at higher levels. While the energy content of distillers grains is similar to corn, unlike corn it also provides significant amounts of protein and phosphorus. Since these are more expensive nutrients to supply, failing to adjust the total ration accordingly can be an expensive mistake.

Especially when feed costs are high and when using different feed ingredients, it pays to test feedstuffs for nutrient quality and balance the ration accordingly. This can help assure needed animal performance with the most economical combination of feedstuffs.

The combination of drought and other market factors have resulted in relatively high ration costs, albeit at a time when market prices are also high. In this changing cost structure it is important to know your own costs of production as the traditional approach may not be as cost competitive as it once was.

**Table 1. Protein and energy equivalent rations, ration cost and cost per pound of crude protein and TDN**

Feedstuffs	Cost	Equivalent rations, lbs/hd/d			Nutrients, dry basis			
		A	B	C	CP, %	\$/lb CP	TDN, %	\$/lb TDN
Alfalfa hay	\$200/ton	16.2	12		17	0.67	58	0.20
Baled corn stalks	\$80/ton	16.2	24	32	4.8	1.11	48.5	0.11
Wet distillers grain	\$78/ton	15	14	25	29.2	.43	90	0.14
Corn	\$6/bu				10	1.26	90	0.14
Limestone				0.3				
Ration Cost, \$/head/day		\$2.85	\$2.71	\$2.26				

## 2012 Cattlemen's Day Research Summaries

The following represents a sampling of the summaries from the 2012 Cattlemen's Day Report. The entire report is online at: <http://www.asi.ksu.edu/cattlemensday>.

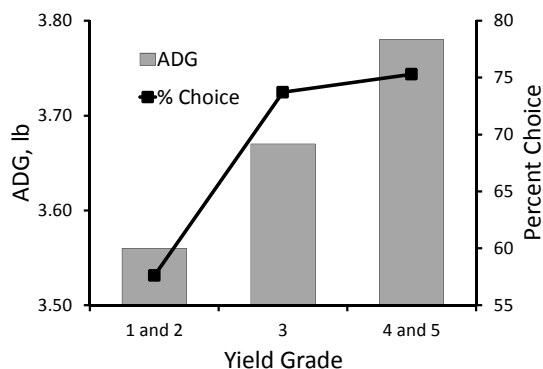
### High-Grading Angus Steers Demonstrate the Greatest Average Daily Gain

M. Hands, C. Reinhardt, T. Marston, J. Waggoner, L. Corah

*Objective:* Determine relationships between feedlot performance and carcass traits in Angus steers.

*Study Description:* Closeout data relating to health, feedlot performance, and carcass data were evaluated for 17,919 Angus steers fed in a single feedlot in southwest Kansas from 1997 through 2007.

*Results:* Multiple treatments for morbidity resulted in poorer average daily gain and a decreased percentage of Choice carcasses. In addition, non-treated steers that graded Prime and Choice had higher average daily gain than those that graded Select or below.



ADG: Linear effect of yield grade,  $P < 0.01$ ; SEM=0.013.  
Choice: Linear and quadratic effects of yield grade,  $P < 0.01$ ; SEM=0.99.

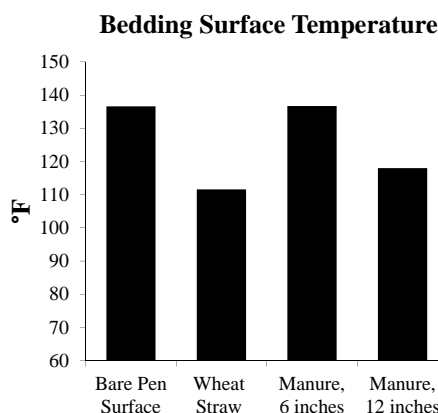
*The Bottom Line:* Ranchers do not need to choose between performance and grade. Avoiding factors that decrease performance, such as disease or nutrient restriction, also improves carcass quality.

### Bedding Material in Dirt-Floor Pens Reduces Heat

D.J. Rezac, D. Thomson, C. Reinhardt

*Objective:* Investigate whether placing straw bedding material in a dirt-surfaced cattle feeding pen during periods of hot weather can provide cattle a cooler place to rest.

*Study Description:* Keeping cattle cooler during hot weather improves animal welfare and animal performance (gain). Providing straw as bedding during times of hot weather has been hypothesized to provide cooler conditions due to the lighter color of the straw and its ability to insulate animals from hot ground temperatures. Plots in a dirt-floor pen, each with a different surface material, were monitored for temperature on a 97°F day. The plots consisted of bare pen surface, 6 inches of straw bedding, 6 inches of manure, or 12 inches of manure.



*The Bottom Line:* Bedding pens with 6 inches of wheat straw resulted in a surface temperature that was 25°F cooler than that of the bare pen surface, potentially providing cattle a cooler place to rest during peak daytime temperatures.

2012  
Cattlemen's  
Day  
Research  
Summaries

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## Increasing Protein Supply to Pregnant Beef Cows When Energy Is Limited Does Not Improve Cow or Calf Performance

E. Bailey, K. Olson, E. Titgemeyer, R. Cochran, T. Jones

**Objective:** Determine the impact of providing supplemental ruminally undegraded protein to beef cows consuming low-quality forage during late gestation.

**Study Description:** Pregnant Angus × Hereford cows (1,160 lb) were used to examine the effects of supplemental ruminally undegraded protein on cow and calf performance. Cows were assigned to receive 1 of 3 supplements. Supplements supplied similar amounts of ruminally degraded protein (0.09% of body weight) and increasing amounts of ruminally undegraded protein: 0.05% (LOW), 0.07% (MOD), or 0.09% of body weight (HI). Cows grazed native tallgrass pasture. Supplements were fed daily from November 25 until all cows had calved.

### Effects of ruminally undegraded protein supplementation on cow and calf performance

Item	Ruminally undegraded protein		
	LOW	MOD	HI
<b>Cow</b>			
Average daily gain, lb/day	0.22	0.15	0.04
Body condition score change	-0.19	-0.20	-0.39
Julian calving date	68	66	64
Pregnancy rate, %	95	95	92
Calving interval, day	364	368	366
<b>Calf</b>			
Birth weight, lb	90	86	86
Weaning weight, lb	538	540	536
Average daily gain (birth to weaning), lb/day	2.18	2.18	2.14

**The Bottom Line:** Additional protein supplementation beyond what is needed to maximize ruminal digestion of fiber is not beneficial to mature cows before calving when energy supply is limiting.

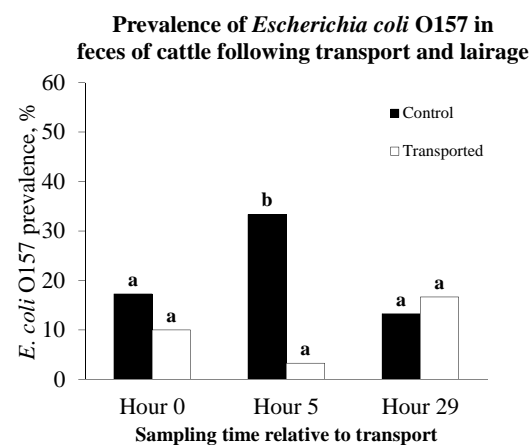
## Effect of Transportation on *Escherichia coli* O157:H7 Prevalence and Coliform Concentrations in Feces of Feedlot Cattle

C. Aperce, J. Drouillard

**Objective:** Mimic stress associated with transport and lairage and evaluate effects on fecal shedding of *Escherichia coli* O157 as well as fecal concentrations of generic *E. coli* and coliforms.

**Study Description:** Previous studies have shown that stressed animals are more likely to shed *Escherichia coli* O157:H7. Given the short generation intervals associated with pathogenic organisms, otherwise normal animals could become heavily colonized by foodborne pathogens as a result of stress incurred during transportation from feedlots and during lairage at abattoirs. We used two groups of cattle to evaluate the effects of transport and lairage on pathogen shedding: a non-transported group (Control) and a group that was transported on a trailer for 1 hour and subsequently held in a pen for a brief lairage period. We measured the prevalence of *E. coli* O157:H7 and enumerated generic *E. coli* and coliforms in fresh fecal pats obtained at 0, 5, and 29 hours post-transit.

**Results:** We observed a significant difference in shedding patterns of control and transported cattle by hour 5 after transport.



<sup>ab</sup>Columns with different letters differ at P < 0.05

**The Bottom Line:** Transport and lairage changed the pattern of fecal shedding for *Escherichia coli* O157:H7 in this experiment. These results encourage further investigation on the prevalence pattern of *Escherichia coli* O157:H7 in transported animals to establish when cattle are at greater risk of contamination at slaughter.

## Effects of Corn Steep Liquor Supplementation On Voluntary Selection of Tallgrass Prairie Hay Contaminated with Sericea Lespedeza (*Lespedeza Cuneata*) and Uncontaminated Tallgrass Prairie Hay

G. Eckerle, K. Olson, J. Jaeger, L. Pacheco

**Objective:** The objective of our study was to determine the effects of a low level of corn steep liquor fed to beef cows on voluntary selection of tallgrass prairie hay contaminated by sericea lespedeza when uncontaminated tallgrass prairie hay was also available.

**Study Description:** Sixteen mature beef cows were housed in individual pens and were fed tallgrass prairie hay contaminated with sericea lespedeza (approximately 30% sericea lespedeza by weight) and uncontaminated tallgrass prairie hay simultaneously. Both sources of hay had similar crude protein (5.5 vs. 5.4%) and acid detergent fiber (41.0 vs. 39.8%) concentrations. Cows were either unsupplemented or supplemented with 1.32 lb/day corn steep liquor (dry basis; equivalent to 3 lb/day as-fed). Forage intake and diet digestion were monitored.

### Effects of low-level corn steep liquor supplementation on forage intake and digestion by beef cows simultaneously offered tallgrass prairie hay that was contaminated with sericea lespedeza and uncontaminated by sericea lespedeza

Item	Corn steep liquor, lb/day (dry basis)		P-value
	0	1.32	
<b>Dry matter intake, % of body weight</b>			
Uncontaminated forage	0.91	0.87	0.65
Contaminated forage	1.06	1.33	<0.01
Total forage	1.97	2.20	0.05
Digestible dry matter	1.97	2.35	<0.01
<b>Total-tract digestibility, %</b>			
Dry matter	50.5	53.9	0.17
Crude protein	17.1	18.5	0.64

**The Bottom Line:** Results from our study were interpreted to suggest that low-level supplementation of corn steep liquor increases acceptance of and tolerance for high-tannin forages by beef cows. Corn

steep liquor ameliorated some of the negative consequences of tannin consumption on digestible dry matter intake. In addition, voluntary consumption of high-tannin forage increased by 25% in supplemented compared with unsupplemented beef cows.

## LED Lighting Extends Color Shelf Life for Three Beef Products Compared with Fluorescent Lighting

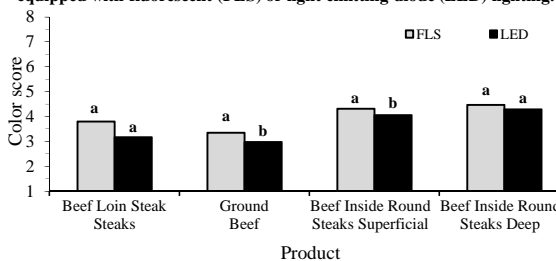
K. Steele, E. Boyle, M. Weber, M. Hunt, A. Lobaton-Sulabo, C. Cundith, Y. Hieber, K. Abrolat, J. Attey, S. Clark, D. Johnson, T. Roenbaugh

**Objective:** Compare effects of light emitting diode (LED) and fluorescent lighting on color stability and shelf-life properties of three beef products displayed in two retail cases set up to run at similar temperature profiles.

**Study Description:** Beef loin steaks, inside round steaks, and ground beef were displayed in two refrigerated retail meat display cases equipped with LED or fluorescent lighting for up to 8 days. Internal product and case temperatures were measured, and products were evaluated for visual and instrumental color, *Enterobacteriaceae* and aerobic plate counts, and oxidative rancidity.

**Results:** Meat retail display cases with LED lighting had lower case temperatures leading to greater efficiency in energy use and extended fresh meat color life of products compared with products under fluorescent lighting. Microbiological growth was not affected by lighting type, but some products had increased oxidation under LED lighting.

Visual color of five products displayed in two meat retail display cases equipped with fluorescent (FLS) or light emitting diode (LED) lighting.



Beef loin steak, ground beef, beef inside round superficial portion color scale: 1 = very bright red, 4 = slightly dark red, 8 = tan to brown. Beef inside round deep portion steak visual color scale: 1 = very bright pinkish red, 4 = slightly dark pinkish red, 8 = tan to brown.

<sup>a</sup>bColumns with different letters differ at P < 0.05

**The Bottom Line:** Using LED lighting in retail meat display cases will save money by reducing overhead operational costs while extending the color life of beef loin steaks, ground beef, and beef inside rounds.

## *Improving Efficiency .... continued from page 1*

**“Improvement in individual animal efficiency, especially during the post-weaning growing or finishing phases, may or may-not improve efficiency at the herd or system level, and may have an undesirable correlated response in traits of cows.”**

*Residual Feed Intake:* Recently, residual feed intake (**RFI**; Koch et al. 1963) has been reintroduced as an efficiency measure for beef production. It is computed as the difference between actual average daily feed intake (**AFI**) and the predicted daily dry-matter intake based on the animal's gain and maintenance requirements for its body weight. The actual calculation results in an RFI value that is not correlated with phenotypic ADG and body weight (an advantage over FCR or FE).

However, research shows underlying genetic correlations between RFI with FI, ADG and BW as well as measures of composition. Computing RFI on the genetic scale as an index of EPDs assures a selection tool with fewer antagonisms. RFI can and does identify efficient animals that also have slow growth and low feed intake making these candidates undesirable for selection and use in the commercial beef industry. Some research suggests that selection for RFI produces slightly larger and leaner cows over time and cows that have older ages at first calving. In general, selection for favorable (negative) RFI results in animals with equivalent performance, but achieves that output with less feed consumed.

*Residual Average Daily Gain:* A concept closely related to RFI is residual average daily gain (**RADG**) which was proposed at the same time as RFI as a potential tool for selection for improved feed efficiency. This term is defined as the difference between actual weight gain and the gain predicted based on dry matter intake, maintenance of body weight and fat cover. In the calculation, differences in ADG are controlled/adjusted for differences in AFI and body weight.

Like RFI, RADG, is a transformation of the data and can be computed based on either the live measurements alone (phenotypic) or by information from both the individual and relative data (genetic). While RADG is indicative of differences in efficiency of feed utilization for growing animals, it may have limited utility for prediction of differences in maintenance efficiency of cows. RADG should not be used alone in selection for feed efficiency. Data reveals that some animals with favorable RADG have sub-par feed intake and consequently undesirable ADG.

*Average Daily Feed Intake:* Also known as **AFI**. AFI is a gross measure of nutrient input. While it

cannot be used alone as a predictor of feed efficiency, it provides a useful data input for computation of a selection index. Feed intake represents an economically relevant measure of cost that can be associated with a variety of output or endpoint measures. AFI could be measured on animals during different phases of production and used to capture input:output (efficiency) information. A selection index for AFI or an AFI EPD can be reliably produced analyzing performance records for a variety of growth traits. An AFI EPD produced without actual feed records but based on genetic associations between growth and intake can account for nearly 75% of the variation in observed feed intake.

These measures of efficiency are most commonly discussed when considering data that measure individual intake of growing animals in a feedlot setting. Cow/calf producers that retain an interest or ownership of calves through harvest may be considering them as options to improve profitability of the finishing phase of production. Since growth is not a desired output of the cow, other measures of cow efficiency are needed that account for reproduction, maintenance and milk production.

