



# BEEF CATTLE RESEARCH UPDATE

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## **Mass Medication Interacts with Temperament of Cattle**

Recent research by Texas A&M University evaluated the effect of metaphylactic therapy (mass medication) on growth, feeding behavior, and intake of Santa Gertrudis steers (583 lb initial weight) during a 28-day receiving period.<sup>1</sup> At processing, steers either received 1.5 mL/cwt of body weight of Excede<sup>®</sup> (ceftiofur crystalline free acid) or no medication (control). As an indicator of cattle temperament, exit velocity (EV) was measured as the rate at which cattle exited the working chute on days 0 and 28. Performance differences between control and mass medicated steers were tested at the mean EV and at one standard deviation below the mean EV (calm steers) and one standard deviation above the mean EV (excitable steers). Average daily gain was similar for control and mass medicated steers in calm steers. Whereas, with excitable steers, mass medicated steers gained significantly faster than controls steers with differences increasing as EV increased. Feed intake declined with increasing EV in control steers, but was unaffected by EV in mass medicated steers. In addition, mass medicated high EV steers consumed more feed than high EV control steers. The frequency that steers visited the feed bunk increased with EV for mass medicated steers but was unaffected by EV in control steers. Mass medicated high EV steers spent 17 minutes longer at the feed bunk per day than high EV control steers. In conclusion, these results suggest that mass medication results in positive effects on daily gain, feed intake, and feeding behavior during the receiving period for steers with high EV (excitable temperaments), whereas, mass medication was of less benefit in steers with low EV (calm temperament).

## **Limit-Feeding a High-Concentrate Diet May Alter Nutrient Absorption**

Newly received feedlot cattle are commonly started on feed by feeding a series of step-up diets, wherein concentrate (grain) levels are gradually increased to promote ruminal adaptation to the high concentrate finishing diet. This gives ruminal microorganisms time to adjust to increasing amounts of readily fermentable starch available in grains. Another means of starting cattle on feed is by limit feeding a finishing diet, with gradual increases in feed intake until cattle are on full feed. Since grains are generally cheaper per unit of energy than roughages, limit feeding a finishing diet should reduce feed cost during a start-up period.

Recent Kansas research used four rumen cannulated steers (948 lb) to compare the effects of a conventional ration step-up program to limit feeding a finishing diet as a means of ruminal adaptation to high concentrate diets.<sup>2,3</sup> Steers were individually fed either (1) three conventional step-up diets followed by a finishing diet starting at 1.5% of body weight (beginning with a 60% and ending with a 92% concentrate diet) or (2) limit fed the finishing diet starting at 1.25% of body weight. Daily feed allotment was increased by 1 lb (step-up) or 0.5 lb (limit feeding) when less than 0.5 lb of feed remained in the bunk. Cattle were stepped up over a 28 day period with 7 days per step. Rumen fluid was collected on days 0, 7, 14, 21, and 28 to look at the effect of diet on volatile fatty acid (VFA) concentration and absorption using the VFA, valerate, as a marker for VFA absorption.

After all cattle reached ad libitum intake of the finishing diet, dry matter intake (% of body weight) was unaffected by treatment. During week 1, valerate absorption was greater for limit fed steers. However, by week 4 valerate absorption was greater for step-up cattle. These researchers concluded that this may suggest that the conventional step-up diet is more effective in adapting the rumen to high concentrate diets. Limit feeding a finishing diet to adapt cattle may reduce feed cost but the resulting decrease in nutrient absorption may not compensate for the reduced ration cost.

### Grain Processing Reduces *E. coli* O157 in Feedlot Cattle

*Escherichia coli* O157 is an important food-borne pathogen for which the gastrointestinal tract of cattle is the major reservoir. *E. coli* O157 is commonly isolated from beef cattle feces and can enter the food chain at harvest. Fecal shedding of *E. coli* O157 in cattle reflects the ability of the organism to colonize the gastrointestinal tract. Evidence suggests that the site of colonization is in the hindgut and not the rumen. Thus, any dietary factor that alters the supply of substrate (such as starch) to the hindgut should affect the growth and survivability of *E. coli* O157 and thus, influence fecal shedding.

Grain type and grain processing alters the site and extent of starch digestion and may alter the survival, growth and colonization of *E. coli* O157 in the hindgut. Grains that are less extensively digested within the rumen produce more starch for the hindgut, increasing fermentation activity and acid production in the hindgut. A recent review of 50 trials tabulated the site of starch digestion for feedlot cattle.<sup>4</sup> This review clearly shows that ruminal starch digestion is considerably greater for wheat than corn or sorghum (Table 1). In addition, it illustrates that steam flaking of grains enhances ruminal starch digestion compared to dry rolling, reducing starch availability to the hindgut. Though, the response to processing is considerably less for wheat than corn or sorghum.

Table 1. Site and extent of starch digestion for feedlot cattle fed diets containing various grains processed in various ways (Source: Owens, 2005).

| Processing Method:                             | Dry Rolled        | Steam Flaked      |
|--|-------------------|-------------------|
| <b>Corn</b>                                    |                   |                   |
| Ruminal disappearance, % dietary starch        | 60.6 <sup>a</sup> | 84.2 <sup>b</sup> |
| Total tract disappearance, % of dietary starch | 89.3 <sup>a</sup> | 99.1 <sup>b</sup> |
| <b>Sorghum</b>                                 |                   |                   |
| Ruminal disappearance, % dietary starch        | 66.8 <sup>a</sup> | 84.9 <sup>b</sup> |
| Total tract disappearance, % of dietary starch | 96.5 <sup>a</sup> | 98.8 <sup>b</sup> |
| <b>Wheat</b>                                   |                   |                   |
| Ruminal disappearance, % dietary starch        | 86.0 <sup>a</sup> | 91.6 <sup>a</sup> |
| Total tract disappearance, % of dietary starch | 97.9 <sup>a</sup> | 98.8 <sup>a</sup> |

<sup>ab</sup>Means in same row sharing a superscript are not different (P<0.05).

Recent Kansas research evaluated the effects of grain type (sorghum or wheat) and grain processing (dry rolled or steam flaked) in finishing diets on the prevalence of *E. coli* O157 in 40 heifers (630 lbs) that tested positive for fecal shedding of *E. coli* O157 prior to starting the trial.<sup>5</sup> The cattle were fed a series of step-up diets to adapt the animals to a high-concentrate finishing diet consisting of 81.4% sorghum or 52% wheat (dry matter basis). Steam flaked corn was added to wheat diets to achieve a similar concentrate to forage ratio among all diets. The mean prevalence of *E. coli* O157 in fecal samples for heifers fed

steam flaked sorghum, dry rolled sorghum, steam flaked wheat and dry rolled wheat diets was 73, 30, 58, and 29%, respectively. Grain type did not impact the prevalence of *E. coli* O157, but grain processing did. The mean prevalence of *E. coli* O157 was lower in heifers fed dry rolled grain (29.5%) than in heifers fed steam flaked grain (74.7%; Figure 1).

In summary, this research suggest that dry rolling of grains may be useful in reducing fecal shedding of *E. coli* O157 in cattle when fed prior to slaughter. Presumably this occurs because dry rolling increases the amount of starch available to the hindgut, enhancing fermentation and acid production which reduces the survivability and growth of *E. coli* O157.

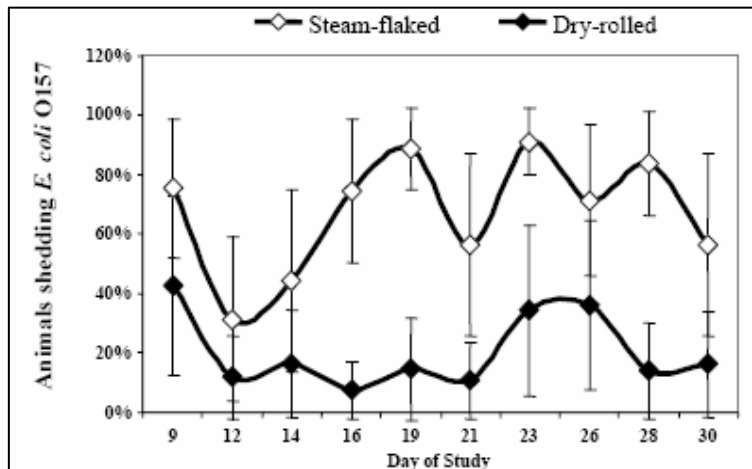


Figure 1. Prevalence of *E. coli* O157 in heifers fed diets with dry-rolled or steam flaked grains. Source: Fox, et al., 2007

- <sup>1</sup> Paddock, Z. D., G. E. Carstens, J. E. Sawyer, R. R. Gomez, B. M. Bourg, P. A. Lancaster, D. K. Lunt, S. A. Moore, and D. S. DeLaney. 2007. Metaphylaxis therapy interacts with temperament to influence performance of growing beef steers. Plains Nutrition Council Spring Conference. Publ. No. AREC 07-20:102 (Abstr.), Texas A&M Univ. Agric. And Ext. Center, Amarillo.
- <sup>2</sup> Wallace, J. O., W. F. Miller, B. J. Johnson, and C. D. Reinhardt. 2007. Limit-feeding a high-concentrate may alter nutrient absorption. Plains Nutrition Council Spring Conference Publ. No. AREC 07-20:110 (Abstr.), Texas A&M Univ. Agric. And Ext. Center, Amarillo.
- <sup>3</sup> Wallace, J. O., W. F. Miller, B. J. Johnson, and C. D. Reinhardt. 2007. Limit-feeding a high-concentrate diet may alter nutrient absorption. Kansas State Univ. Beef Cattle Research Report of Progress 978:49-52.
- <sup>4</sup> Owens, F. 2005. Impact of grain processing and quality on Holstein steer performance. Pages 121-140 in Managing and Marketing Quality Holstein Steers Proc., Rochester, MN.
- <sup>5</sup> Fox, J. T., J. S. Drouillard, M. E. Jacob, S. L. Reinstein, and T. G. Nagaraja. 2007. Grain processing reduces *E. coli* O157 in feedlot cattle. Kansas State Univ. Beef Cattle Research Report of Progress 978:105-107.

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