



EXTENSION
BEEF CATTLE RESEARCH UPDATE
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Effect of Injectable Vitamin C on Post-Transit Performance of Beef Steers

Vitamin C or ascorbic acid is a strong water-soluble antioxidant that has many roles in cellular metabolism and is linked to many of the major antioxidant pathways. It is synthesized from glucose in most mammalian species including ruminants. Dietary vitamin C is most likely destroyed in the rumen, and so, provision to ruminants would need to be as an injectable product. Since, cattle naturally synthesize ascorbic acid, vitamin C dietary requirements are currently not set for cattle.¹

Iowa State University Research determined the effects of injectable vitamin C before vs. after a long-distance transit event on feedlot performance of beef steers.² The study used 72 Angus-based steers (784 lb) randomly assigned to 1 of 3 injectable treatments (24 steers per treatment): CON = saline injection pre and post-transit, PRE = vitamin C injection pre-transit and saline injection post-transit, or POST = saline injection pre-transit and vitamin C injection post-transit. Treatment injections, 20 mL of saline or 20 mL sodium ascorbate (250 mg/mL; 5 g/steer), were delivered intramuscularly (10 mL/injection site) immediately prior to (day 0) and after (day 1) an 18-hour (1,041 miles) transit event. After the transit event, the steers were sorted into pens (6 steers/pen) equipped with GrowSafe bunks (measure individual feed intakes) and housed there for the remainder of the 57-day trial. A common corn silage-based diet was fed.

These researchers reported that injectable vitamin C affected mid (day 30/31; $P = 0.01$) and final (day 56/57; $P = 0.02$) body weights (BW) with PRE-steers having the greatest BW. At the end of the trial, steers that received injectable vitamin C prior to transit weighed 21 lb more than steers that did not receive a vitamin C injection and 15 lb more than steers that received vitamin C post-transit. In addition, injectable vitamin C (PRE and POST) tended to improve overall dry matter intake as compared to CON-steers ($P = 0.07$). PRE-steers had greater overall average daily gain than POST ($P = 0.04$) or CON-steers ($P = 0.01$). Overall gain efficiency (Gain:Feed ratio) was not affected by injectable vitamin C ($P = 0.30$). These authors concluded that these data “suggest administering injectable vitamin C prior to transit is an effective way to overcome the negative effects of transit on cattle performance”.

Effect of Increasing Hay Inclusion in Silage-Based Receiving Diets on Performance in Newly Weaned Beef Steers

The response and performance of feedlot cattle during the overall feeding period is affected by their health and performance response during the receiving period. The receiving period is crucial to the economic outcome of cattle feeding. Research has shown that feed intake of newly received feedlot cattle during the first week of the receiving period can range from 1% of body weight (BW) in morbid calves to 1.6% of BW in healthy calves.³ In general, starting cattle on high roughage diets results in lower incidences of morbidity and mortality.

A 2016 survey of consulting feedlot nutritionists indicated that 64% of the clients serviced by the nutritionists fed hay at receiving for an average of 4 days.⁴ This survey also showed that only 4.2% of the respondents indicated that they use corn silage as a primary roughage source in receiving calf diets. However, corn silage is a primary feed ingredient for beef production in the Midwest since it is an option for marketing home-raised feedstuffs through cattle.

The sources of dietary roughage in receiving diets fed to feedlot cattle are important in facilitating adaptation to the new diet in naïve, newly weaned feeder calves. Dry forage feedstuffs are more familiar to cattle transitioning into the feedlot from pasture; however, many feedlots in the upper Midwest region of the United States use ensiled forages.

South Dakota State University research evaluated the influence of grass hay inclusion in replacement of corn silage in receiving diets on animal growth performance in newly weaned beef steers⁵. In this study, 162 newly weaned, Charolais × Red Angus beef steers (613 lb) were transported 319 miles from a sale barn in western South Dakota to the Ruminant Nutrition Center in Brookings, SD. The following corn silage-based treatment diets (were fed during a 56-day receiving period (dry matter basis): 1) 0% grass hay, 2) 10% grass hay, or 3) 20% grass hay inclusion in replacement of corn.

No morbidity or mortality was recorded during the course of the receiving period. These researchers reported that increasing dietary inclusion of hay had no appreciable influence ($P \geq 0.11$) on final BW, average daily gain, or efficiency (gain:feed ratio). However, grass hay inclusion in replacement of corn silage increased (linear effect, $P = 0.01$) dry matter intake (DMI) by nearly 9% for 20% grass hay compared with 0% grass hay (14.24, 14.86, and 15.52 lb/day for 0, 10, and 20% grass hay treatments). They concluded that these data indicate that grass hay should be considered in corn silage-based receiving diets to improve DMI since in high-risk calves, improved DMI could result in a lower incidence of morbidity, although no morbidity was observed in any steers this study.

¹ NASEM. 2016. Nutrient requirements of beef cattle: Eighth revised edition. National Academies Press, Washington, D.C. p. 149.

² Deters, E. L. and S. L. Hansen. 2019. Injectable vitamin C improves post-transit performance of beef steers. 2019 Plains Nutrition Council Spring Conference: pp.126-127 (Abstr.).

³ Hutcheson, D. P. and N. A. Cole. 1986. Management of transit-stress syndrome in cattle: Nutritional and environmental effects. *J. Anim. Sci.* 62: 555-560.

⁴ Samuelson, K. L., M. E. Hubbert, M. L. Galyean, and C. A. Löest. 2016. Nutritional recommendations of feedlot consulting nutritionists: The 2015 New Mexico State and Texas Tech University survey. *J. Anim. Sci.* 94: 2648-2663.

⁵ Smerchek, D. T., E. M. Buckhaus, K. D. Miller and Z. K. Smith. 2020. Increasing hay inclusion in silage-based receiving diets and its effects on performance and energy utilization in newly weaned beef steers. *Transl. Anim. Sci.* 4:848-853.