



EXTENSION
BEEF CATTLE RESEARCH UPDATE
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Feeding a High-Energy Finishing Diet upon Arrival to High-Risk Feedlot Calves: Effects on Health, Performance, and Carcass Traits

When high-risk cattle arrive at the feedlot, they have low feed consumption and a greater risk for disease because of stress, inflammation, and exposure to pathogens resulting in increased susceptibility to bovine respiratory disease (BRD). Due to low feed consumption, newly arrived cattle may not be able to meet their energy requirement for growth during the first several weeks after feedlot arrival.

A 2005 review of several receiving trials conducted at the Clayton Livestock Research Center (Clayton, NM) during the 1970's and 1980's concluded that the optimum dietary strategy for starting lightweight, highly stressed, newly received cattle on feed would be to feed a 50 to 75% concentrate milled diet.¹ This allowed cattle to perform well without economically important negative effects on receiving period health. A 2016 survey of consulting feedlot nutritionists showed in receiving diets, 30% or greater (dry matter basis) roughage was used most frequently in the diet.²

Due to the increased availability of fibrous grain-milling products (GMP), starch concentrations have decreased in feedlot diets without greatly reducing energy. The reduced starch concentrations afforded by these products may provide an opportunity to provide a high-energy finishing diet containing GMP to high-risk, newly received cattle with less risk for ruminal acidosis and improved performance.³ West Texas A&M University researchers hypothesized that providing a GMP-containing, high-energy finishing diet upon arrival to high-risk calves would result in greater growth performance and improved feed efficiency compared with a low-energy receiving diet with no effect on BRD morbidity.⁴

In their study, a total of 400 high-risk beef calves (299 bulls and 101 steers) with an initial body weight of 556 lb were purchased from auction markets in South Texas and shipped 457 miles to the West Texas A&M University Research Feedlot on five different arrival dates (May 6, 14 and 21; July 28; and August 19, all in 2020). The cattle were used in a generalized complete block design and randomly assigned to receive: 1) finishing diet for the entire feeding period (FIN) or 2) receiving diet for the first 56 days, followed by an 18-day transition to the finishing diet (REC) on day 74. The composition and nutrient profile of the treatment diets are shown in Table 1.

The effects of dietary treatment on growth performance are shown in Table 2. Body weight (BW) on day 74 was greater (772 vs. 750 lb, $P < 0.01$) and final BW tended to be greater for FIN compared with REC (1407 vs. 1387 lb, $P = 0.10$). Cattle fed FIN had less dry matter intake (DMI) from days 0 to 74 than REC cattle (13.60 vs. 15.79 lb/day $P < 0.01$), but DMI did not differ ($P = 0.80$) after day 74. From days 0 to final, DMI was 0.57 lb less for FIN compared with REC ($P = 0.01$). During the first 74 days, FIN had 9.8% greater average daily gain (ADG) than REC (3.22 vs. 2.93 lb/day, $P < 0.01$) with no difference in ADG from day 74 to final. In addition, cattle consuming FIN had increased efficiency (Gain:Feed) from days 0 to 74 (0.236 vs. 0.186, $P < 0.01$). After day 74, when all cattle were consuming the finishing diet and had similar DMI, there was no difference ($P = 0.80$) in efficiency. However, over the entire feeding period, efficiency was 6% greater for FIN than REC (0.176 vs. 0.166, $P < 0.01$).

Hot carcass weight was greater for FIN cattle than REC cattle (913 vs. 893 lb, ($P = 0.04$). No difference ($P \geq 0.11$) in ribeye area, 12th rib fat thickness, yield grade, or quality grade were observed. In addition, there was no difference ($P = 0.18$) in liver abscess rate.

Table 1. Composition and nutrient concentration of treatment diets.

| Item | Treatments | |
|----------------------------------|------------------|------------------|
| | REC ¹ | FIN ² |
| Ingredient, % of Dry Matter (DM) | | |
| Steam-flaked corn | 24.2 | 62.0 |
| Sorghum-sudan hay | 32.0 | - |
| Corn stalks | - | 8.0 |
| Molasses blend ³ | 5.0 | 2.5 |
| Corn oil | - | 3.0 |
| Sweet Bran ⁴ | 35.0 | 20.0 |
| Supplement ⁵ | 3.8 | 4.5 |
| Nutrient analysis, DM basis | | |
| Dry matter, % | 75.5 | 78.0 |
| Crude protein, % | 13.9 | 13.2 |
| Crude fat, % | 2.43 | 5.43 |
| NEm, Mcal/lb | 0.75 | 0.99 |
| NEg, Mcal/lb | 0.48 | 0.68 |

¹REC, cattle fed a receiving diet for the first 56 days then transitioned to a finishing diet over 18 days.

²FIN, cattle fed a finishing diet for the entire feeding period.

³72 Brix Molasses Blend (Westway Feed Products LLC, Hereford, TX).

⁴Sweet Bran (Cargill, Blair, NE).

⁵Supplements were formulated to meet or exceed nutrient requirements for vitamins and minerals and mimic current feedlot practices.

Table 2. Performance of cattle fed a receiving or finishing diet upon arrival to the feedlot.

| Item | Treatments | | P-value |
|----------------------------|------------------|------------------|---------|
| | REC ¹ | FIN ² | |
| Body weight, lb | | | |
| Day 0 | 534 | 534 | 0.26 |
| Day 74 | 750 | 772 | <0.01 |
| Final | 1387 | 1407 | 0.10 |
| Dry matter intake, lb/day | | | |
| Days 0 to 74 | 15.79 | 13.60 | <0.01 |
| Days 74 to final | 19.82 | 19.89 | 0.80 |
| Days 0 to final | 18.70 | 18.13 | 0.01 |
| Average daily gain, lb/day | | | |
| Days 0 to 74 | 2.93 | 3.22 | <0.01 |
| Days 74 to final | 3.31 | 3.31 | 0.99 |
| Days 0 to final | 3.11 | 3.20 | 0.18 |
| Gain:Feed | | | |
| Days 0 to 74 | 0.186 | 0.236 | <0.01 |
| Days 74 to final | 0.167 | 0.166 | 0.80 |
| Days 0 to final | 0.166 | 0.176 | <0.01 |

¹REC, cattle fed a receiving diet for the first 56 days then transitioned to a finishing diet over 18 days.

²FIN, cattle fed a finishing diet for the entire feeding period.

Adapted from Crawford et al., 2022.

There were no differences ($P \geq 0.31$) in health outcomes in this study. This suggests that feeding a high-energy finishing diet in lieu of a traditional receiving diet containing higher concentrations of roughage increases growth performance and feed efficiency but does not alter the health of high-risk cattle. In contrast, research published in 1975 concluded that feeding a 90.0% concentrate diet compared with a 72.0% or 55.0% concentrate diet increased morbidity of auction-derived steers.⁵ Similarly, the 2005 review of receiving trials conducted at the Clayton Livestock Research Center reported a correlation between increased concentrate level and morbidity of feedlot cattle.¹ The authors of this current research suggested that this discrepancy between their research and that of the earlier research could be influenced by differences in diet formulations between studies. The

diets used in the current study contained fibrous grain-milling products, which may have reduced the rate of starch fermentation and mitigated the incidence of acidosis.

In conclusion, the results of this study suggest that providing a high-energy finishing diet containing fibrous grain-milling products fed ad libitum to high-risk calves upon arrival may be a viable alternative to a low-energy receiving diet. This diet increased growth performance and feed efficiency without impacting health.

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- ¹ Rivera, J.D., M.L. Galyean, and W.T. Nichols. 2005. Review: Dietary roughage concentration and health of newly received cattle. *Prof. Anim. Sci.* 21:345-351.
 - ² 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.
 - ³ Krehbiel, C., R. Stock, D. Herold, D. Shain, G. Ham, and J. Carulla. 1995. Feeding wet corn gluten feed to reduce subacute acidosis in cattle. *J. Anim. Sci.* 73:2931–2939.
 - ⁴ Crawford, D. M., J. T. Richeson, T. L. Perkins and K. L. Samuelson. 2022. Feeding a high-energy finishing diet upon arrival to high-risk feedlot calves: effects on health, performance, ruminal pH, rumination, serum metabolites, and carcass traits. *J. Anim. Sci.* 100. <https://doi.org/10.1093/jas/skac194>
 - ⁵ Lofgreen, G. P., J. R. Dunbar, D. G. Addis, and J. G. Clark. 1975. Energy level in starting rations for calves subjected to marketing and shipping stress. *J. Anim. Sci.* 41:1256–1265.