

# Animal Science Research Report

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### Manger space restriction does not negatively influence growth efficiency in program fed feedlot heifers.

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#### Rationale and Approach

A main goal of a backgrounding program is to suppress fat or lipid deposition and promote growth of bones and lean tissue through achieving less-than-maximal growth (Block et al., 2001). Controlling or managing feed intake relative to the *ad libitum* amount is not a new concept to the cattle feeding industry. Feed intake can be managed via restricted feeding or programmed feeding (Galyean et al., 1999). Program feeding uses net energy (NE) equations to calculate the quantity of feed required for bodily maintenance at a desired rate of gain. The objective of this research was to determine the influence manger space restriction had on program-fed feedlot heifers during the growing phase. Charolais × Angus heifers [initial body weight (BW) = 725 ± 1.3 lb] were used in a 109-d backgrounding study. Heifers were received approximately 60 d prior to study initiation. Initial processing (53 d before study initiation) included individual BW, application of an identification tag, vaccination against viral respiratory pathogens and clostridial species, and administration of doramectin pour-on for control of internal and external parasites. All heifers were administered 36 mg of zeranol at study initiation and were assigned to 1 of 10 pens ( $n = 5$  pens/treatment with 10 heifers/pen) in a randomized complete block design (blocked by location) and offered a common diet (Table 1). Each pen was randomly assigned to 1 of 2 treatments: 8 inches (8IN) or 16 inches (16IN) of linear bunk space/heifer. Heifers were individually weighed on days 1, 14, 35, 63, 84, and 109. Heifers were programmed to gain 3 lb daily based on predictive equations set forth by the California Net Energy System. To calculate predictive values, a final BW of 1268 lb was assumed to be the mature BW of the heifers and tabular net energy values of 93.0 NEm (Mcal/cwt) and 62.0 NEg (Mcal/cwt) from days 1 to 22, 91.0 NEm and 61.0 NEg from days 23 to 82, and 89.0 NEm and 60.0 NEg from days 83 to 109 were used. Data were analyzed using the GLIMMIX procedure of SAS 9.4 with manger space allocation as the fixed effect and block as the random effect.

#### Findings

No differences ( $P > 0.35$ ) were observed between 8IN or 16IN heifers for initial BW, final BW, average daily gain, dry matter intake, feed efficiency, variation in daily weight gain within each pen or applied energetic measures (Table 2). No differences ( $P > 0.35$ ) were observed between treatments for morbidity. Although not statistically analyzed, 8IN heifers appeared to have looser stools during the first 2 weeks compared to the 16IN heifers.

#### Implications

These data suggest restricting manger space allocation from 16 to 8 in. did not negatively influence gain efficiency or the efficiency of dietary net energy utilization in heifers programmed fed a



concentrate-based diet to gain 3 lb daily. The use of tabular net energy values and required net energy of maintenance and retained energy equations are effective means to program cattle to a desired rate of daily gain during the growing phase.

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## References

Block, H., J. McKinnon, A. Mustafa, and D. Christensen. 2001. Manipulation of cattle growth to target carcass quality. *J. Anim. Sci.* 79:133–140. doi:10.2527/2001.791133x.

Galyean, M. L., E. E. Hatfield, and T. L. Stanton. 1999. Review: restricted and programmed feeding of beef cattle—definitions, application, and research results11manuscript no. t-5-380 of the college of agric. Sci. Nat. Res. Prof. Anim. Sci. 15:1–6. doi:10.15232/S1080-7446(15)31715-0.

**Table 1.** Actual dietary formulation and tabular nutrient content for heifers offered a limit fed diet and 8 (8IN) or 16 (16IN) in of linear bunk space per heifer through the 109 d feeding experiment.<sup>1</sup>

Item	d 1 to 22	d 23 to 82	d 83 to 109
Dry-rolled corn <sup>2</sup> , %	20.80	16.42	48.04
High-moisture corn, %	43.23	33.40	-
Dried distillers grains plus solubles, %	14.71	15.28	15.01
Oat hay, %	15.36	-	-
Corn silage, %	-	29.82	32.03
Liquid supplement <sup>3</sup> , %	5.89	5.08	4.92
<b>Dietary information</b>			
Diet dry matter, %	79.65	57.04	54.68
Crude protein, %	13.31	12.94	12.80
Neutral detergent fiber, %	21.02	24.16	24.91
Acid detergent fiber, %	11.13	13.21	13.69
Ash, %	6.46	6.05	6.03
Organic matter, %	93.54	93.95	93.97
Ether extract, %	3.59	3.59	3.58
Tabular net energy for maintenance, Mcal/cwt	93.0	91.0	89.0
Tabular net energy for gain, Mcal/cwt	62.0	61.0	60.0

<sup>1</sup>All values except DM on a DM basis.

<sup>2</sup>Melengestrol acetate (MGS, Zoetis) was included at 0.50 mg/heifer daily in a premix that replaced a portion of the dry-rolled corn.

<sup>3</sup>From d 1 to 22 (dry-matter basis): 36.27% crude protein, 28.00% non-protein nitrogen, 0.74 Mcal/lb net energy for maintenance, 0.50 Mcal/lb net energy for gain, 1.62% crude fat, 4.62% Ca, 0.43% P, 2.28% K, 0.47% Mg, 5.00% salt, 3.38% Na, 0.54% S, 4.00 ppm Co, 200.00 ppm Cu, 20 ppm I, 11.41 mg/lb EDDI, 150.29 ppm Fe, 400.00 ppm Mn, 3.08 ppm Se, 700.00 ppm Zn, 20,000.00 IU/lb Vitamin A, 200.00 IU/lb Vitamin E, Monensin 500 g/907-kg. From d 23 to 109 (dry-matter basis): 41.86% crude protein, 38.38% non-protein nitrogen, 0.43 Mcal/lb net energy for maintenance, 0.30 Mcal/lb net energy for gain, 0.91% crude fat, 10.89% Ca, 0.32% P, 7.00% K, 0.22% Mg, 6.03% salt, 3.07% Na, 0.33% S, 4.23 ppm Co, 199.88 ppm Cu, 11.99 ppm I, 6.84 mg/lb EDDI, 83.16 ppm Fe, 304.81 ppm Mn, 2.90 ppm Se, 664.59 ppm Zn, 19,987.55 IU/lb Vitamin A, 199.88 IU/lb Vitamin E, Monensin 579.35 g/ton



**Table 2.** Cumulative growth performance responses for heifers offered a limit fed diet and 8 (8IN) or 16 (16IN) in. of linear bunk space per heifer through the 109-d feeding experiment.<sup>1</sup>

Item	Treatments		SEM	P - value
	8IN	16IN		
Pens, n	5	5	-	-
Heifers, n	50	49	-	-
<b>Cumulative growth</b>				
Initial Body Weight, lb	725	726	1.3	0.77
Final Body Weight, lb	1038	1044	6.5	0.43
Average Daily Gain, lb/d	2.87	2.92	0.060	0.46
Dry Matter Intake, lb	17.73	17.73	0.002	0.35
Feed:Gain (DMI/ADG)	6.18	6.07	0.033	0.46
S.D. ADG	0.40	0.36	0.039	0.39
<b>Applied energetics measures<sup>2</sup></b>				
Observed Net Energy for Maintenance (NEm), Mcal/cwt	90.34	91.33	1.222	0.44
Observed Net Energy for Gain (NEg), Mcal/cwt	60.63	61.50	1.071	0.44
Observed to expected NEm	1.00	1.01	0.013	0.47
Observed to expected NEg	0.98	0.99	0.016	0.42

<sup>1</sup>A 4% shrink was applied to the initial BW measure to account for digestive tract fill and all subsequent BW measures were pencil shrunk 2% to account for digestive tract fill.

<sup>2</sup>Calculated from observed cumulative growth performance assuming a mature BW of 1268 lb and a tabular NEm and NEg of 90.7 Mcal/cwt and 60.7 Mcal/cwt of NEm and NEg, respectively.

