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RELATIONSHIP BETWEEN NET FEED INTAKE, PERFORMANCE TRAITS AND ULTRASOUND MEASURES OF COMPOSITION IN BEEF STEERS

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Background: Feed costs represent the single largest expense in producing beef yet most genetic selection in beef cattle has focused on growth and carcass traits. Selection strategies are needed that will improve feed efficiency in beef cattle without compromising productive traits. Traditionally, feed efficiency has been defined as feed conversion ratio (**FCR**; feed intake per unit of gain), which is a gross measure of efficiency in that it does not attempt to account for feed requirements needed for maintenance and growth. Because FCR is strongly related to growth rate, selecting cattle with a lower FCR (more efficient) will result in cattle with increased growth potential and larger mature body weights. Therefore, selection for FCR will increase cow size and feed requirements of the breeding herd and not necessarily improve overall feed efficiency. An alternative measure of feed efficiency is net feed intake (**NFI**), which is a measure of the variation in feed intake (**FI**) beyond that required to support maintenance and growth needs. NFI is calculated as the difference between actual FI and the amount of feed an animal is expected to eat based on its size and growth rate. As efficient animals are those that eat less feed than expected based on their size and growth rate, efficient animals will have negative NFI. Previous research has shown that NFI is moderately heritable and not related to growth rate. Thus, selecting for NFI may provide opportunities to select for improved feed efficiency without increasing the mature size of the breeding herd. The objective of this study was examine the relationships between NFI and performance traits in growing steers, and to determine if body composition was different between steers identified as being efficient (low NFI) or inefficient (high NFI).

Research Findings. Braunvieh-sired crossbred steers were individually fed a roughage-based pelleted diet (70% TDN; 13.7% CP, DM basis) using Calan electronic gate feeders at College Station (N = 57) and McGregor (N = 112). Following 30 days of adaptation, body weights (**BW**) were measured weekly and FI measured daily for 77 days. NFI was calculated as difference between actual FI and FI predicted from multiple regression of FI on mid-test $BW^{.75}$ and ADG. Ultrasound measures of 12th rib fat thickness (**BF**), ribeye area (**REA**) and intramuscular fat (**IM**) were obtained on day 70. NFI was not correlated with final BW, ADG, REA or IM, but was correlated with FI, FCR and BF (Table 1). High NFI steers (inefficient steers) ate 19% more feed and had 23% higher

FCR than low NFI steers (efficient steers), whereas, ADG and BW were similar for high and low NFI steers. High NFI steers had more BF, but similar REA and IM fat compared to low NFI steers. The fact that low NFI steers were leaner is one reason these steers were more efficient then high NFI steers. However, since the magnitude of this difference in composition was small, it is likely that other factors (e.g., activity, energy requirements for maintenance and growth) were also involved in accounting for differences in net feed efficiency.

Applications. These results demonstrate that NFI may provide opportunities to select cattle that are more efficient without affecting the genetic potential for growth or mature body size.

Table 1. Partial correlations between net feed intake (NFI) and feed conversion ratio (FCR; feed/gain) in steers fed a roughage-based pelleted diet.

Trait	NFI	FCR
Initial BW, lb	.002[a] (.98)[b]	.29 (.0001)
Final BW, lb	.002 (.98)	-.10 (.20)
ADG, lb/d	.001 (.99)	-.72 (.0001)
FI, lb/d	.595 (.0001)	.01 (.89)
FCR, feed/gain	.485 (.001)	–
12th rib fat, mm	.22 (.004)	-.022 (.77)
REA, cm²	.032 (.68)	.06 (.47)

[a]Numbers represent correlation coefficients.
[b]Values in parentheses are P values.

Table 2. Performance traits and ultrasound measures of composition of steers with low, middle and high net feed intake (NFI).

Trait	NFI Group			SE	P-value
	Low	Middle	High		
N	56	5756	--	–	
Initial BW, lb	541	535	541	9.5	NS†
Final BW, lb	713	708	714	11.6	NS
ADG, lb/day	2.26	2.27	2.25	.07	NS
FI, lb/day	19.6	21.3	23.4	.41	.0001
NFI, lb/day	-2.08	-0.19	1.83	.14	.0001
FCR, feed/gain	8.77	9.59	10.76	.27	.001
12th rib fat, in	.156	.161	.168	.004	.05
REA, in²	8.15	8.10	8.36	.14	NS

†NS = nonsignificant.