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Beef Science Cluster

Selecting for improved feed efficiency and carcass quality: putting theory into practice

Project Title:	Project Code:	FDE.17.13
Improvement of cow feed efficiency and the production of consistent quality beef using molecular breeding values for RFI and carcass traits	**Completed:**	*March 2018*

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Background

Research under the first Beef Science Cluster (FDE.05.09a n d BQU.03.10) identified a number of genomic markers for feed efficiency and carcass characteristics in feedlot cattle. However, the potential impact of selecting for improved feedlot feed efficiency on maternal traits (cow winter feed requirements and reproductive traits) is unknown. The ability of genomic carcass quality markers to sort feedlot cattle into more uniform slaughter groups has not been studied.

Objectives

To demonstrate the use and economic value of genomic tools to breed more efficient cow herds and to sort feeder cattle into more uniform slaughter groups

What They Did

One study used 420 crossbred cows, each randomly divided into control vs. efficient groups based on age, body weight and breed composition. In addition, two purebred herds of 125 Charolais and 200 Angus cows were selected for efficiency.
The crossbred control group was selected based on traditional measurements such as weight at one year of age, average daily gain from birth to one year of age, birth weight, and calving ease. The efficient heifers were selected based on a multi-trait maternal index based on EPD's for both maternal and direct weaning weights, as well as residual feed intake (RFI) and feedlot profitability traits (in Charolais heifers only), Sires were replaced at a rate of 25%/year, and were selected similarly to heifers. Tradional EPD's

were used and compared to selection using genomically enhanced EPDs.Cows were measured for reproductive performance, and progeny measured for individual feed intake, growth, and carcass characteristics.

Steer progeny from this breeding program were used in the second study, genetic testing was done on steers and ADG, backfat adjusted RFI, carcass weight, grade fat, ribeye area, marbling score and lean meat yield were calculated for all steers based on their genetic makeup. On paper steers were assigned to one of four groups based on these calculated scores; Quality (above average lean meat yield and marbling score), Lean (above average lean meat yield but average or below marbling score), Marbling (average or below for lean meat yield and above average for marbling score), or Other (average or below for both lean meat yield and marbling score), All steers were managed equally and fed using GrowSafe for the final 90-100 d of feeding to obtain RFI and individual feed intake. Carcass data was collected and analyzed from all steers to evaluate whether the group they were assigned to based on the genetic calculations was accurate for the actual carcass data.

What They Learned

By selecting for RFI throughout this study researchers were able to improve feedlot feed efficiency in the herd in which it was selected for by 0.33% per year. Researchers saw no effects on maternal productivity traits including age at first calving, calving dates, pregnancy, calving and weaning rates and no adverse effects on calf performance traits including birth/weaning weights and both pre- and post-weaning daily gains.

In the second study researchers were able to validate that molecular breeding values for carcass traits could be used to improve uniformity in carcass traits. Results showed that on average, Quality and Marbling groups had greater backfat and more marbling while the Lean group had leaner carcasses. Carcass weights were similar across all groups. Within groups, decreases in variability were observed for most traits suggesting improvement in carcass uniformity.

What it Means

An improvement in RFI of 0.33% per year might seem small, however, as the percentage of cows replaced in the herd under the new selection program increases, and these changes occur over a longer period of time, it could have a significant impact on feed efficiency of the entire beef herd. With the evidence provided in this study it appears that producers can incorporate RFI into the genetic traits they are selecting for with no adverse effect on maternal traits in a cow-calf operation. That being said, this study was only 4 years and more years of selection would help to determine the effects on maternal traits.

The ability to sort cattle according to molecular breeding values for various traits has the potential to allow producers to sort feeder cattle into expected carcass outcomes to improve consistency. The next step is to validate these markers in unrelated commercial herds. If these markers still work in the unrelated herds than this would provide producers with the opportunity to manage steers optimally according to their genetic potential in the feedlot to determine the maximal gains that can be achieved.

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