

Igenity Beef Molecular Breeding Values an Effective Estimate of Carcass Quality in Crossbred Cattle

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KEY POINTS

- This study was conducted on 2,171 commercial heifers of various breed composition, fed for 206 days in a feedlot in Washington state. Carcass measurements and camera information were provided by Tyson Foods in Pasco, Washington.
- The 2,072 heifers with genomic test results received Igenity 1–10 scores that were normally distributed for hot carcass weight, marbling, 12th rib fat thickness, and rib-eye area. Relationships between these estimates and actual performance data were strongly positive.
- Based on the Igenity Terminal Index score, the top 25% of heifers returned \$101.10 more, on a per head basis, than the bottom 25%. This results in a total of \$51,257.70 additional revenue across all 507 heifers.

INTRODUCTION

Designed to predict genetic merit for crossbred cattle of Angus, Gelbvieh, Hereford, Limousin, Red Angus, and Simmental descent, Igenity[®] Beef was developed by the scientists at NEOGEN GeneSeek as a tool to help commercial producers select replacement heifers to fit their operation's goals.

Using only genotypes, Igenity Beef translates a molecular breeding value into a simple 1 to 10 score for a total of 16 traits fitting into maternal, growth, and carcass categories.

These scores give commercial producers the ability to gauge the genetic merit of their herd and better inform replacement heifer selection as well as mating decisions. In addition, Igenity Beef provides producers with three indexes to aid in multi-trait selection.

The objective of this report is to outline the efficacy of Igenity Beef when predicting genetic merit.

MATERIALS AND METHODS

In the summer of 2018, a total of 2,171 crossbred heifers weighing an average of 691.3 lb (SD=70.4; range = 495 to 1020 lb) were transported to a feedlot in Washington and processed. Individual body weights were recorded on arrival (day 0) and an initial Synovex Choice (Zoetis LLC, New York, NY) implant given before being separated into pens. On day 133.9 (SD = 19.4), heifers were weighed and re-implanted with Component TE-200 (Elanco US, INC, Greenfield, IN).

Heifers were harvested on day 206.4 (SD = 12.3). Data were recorded on 2,101 heifers and included carcass measurements and camera information reported by the Tyson Foods processing plant in Pasco, WA. Heifers were either removed from the study due to morbidity or missing slaughter information.

At enrollment, a tissue sample unit was collected on all heifers and sent to NEOGEN GeneSeek Operations



Figure 1. Timeline of experimental design and feedlot protocol.



(Lincoln, NE) for processing. All samples were first characterized using BreedSeek V2 to estimate breed composition, followed by Igenity Beef. A total of 74 heifers did not have viable DNA samples and therefore genomic results could not be reported. The final number of animals used in this summary was 2,027. Statistical analysis of these data were completed based on the allocation of animals to pens and the protocol of the feedlot.

RESULTS AND DISCUSSION

To fully describe the heifers in the study, two tables have been provided. **Table 1** includes enrollment information, closeout data, and summarized Igenity scores, while **Table 2** provides a snapshot of breed composition (as a percentage) of heifers. Heifers were majority Angus (64% - as a combination of Angus and Red Angus), followed by Hereford (10.75%), Simmental (8.75%), Gelbvieh (6.75%), and Limousin (5.25%), all of which are included in the training population for Igenity Beef. Outside of the six breeds, these heifers also had some Shorthorn (3.5%) and Brahman (1%) influence as well. Overall, it can be concluded these heifers were very representative of the population of cattle Igenity Beef was designed for.

The relationship between Igenity Beef scores and average closeout data on all heifers (n = 2,072) were estimated for 12th-rib fat thickness (FAT), hot carcass weight (HCW), marbling (MARB), and ribeye area (REA) with R2 values of 0.97, 0.95, 0.95, and 0.92, respectively. These values are an aggregate across all 20 lots of cattle. Actual correlations on an individual animal basis between Igenity score and MARB, FAT, HCW, and REA were 0.36, 0.29, 0.23, and 0.18, respectively. As a summary, Figure 2 shows the relationship between closeout data and Igenity scores on average (Figures 2a and 2c), and on a within lot basis (Figures 2b and 2d) for HCW and MARB. The actual data and estimated trend line are very similar as an average across all animals and pens of cattle. Even on a per lot basis, the more common scores ranging from 4–8 are very well characterized. Variation in relationship occurs in less frequently observed Igenity scores of 1–3 and 9–10.

Variable	n	Mean	SD	Range
Enrollment weight, lb	2,101	691.30	70.40	495 to 1020
Days on feed, d	2,101	206.40	12.3	183 to 232
Hot carcass weight, lb	2,101	890.0	79.83	410 to 1152
USDA Quality Grade ¹	2,101	3.02	0.50	1 to 4
USDA Yield Grade ²	2,092	3.56	0.80	1 to 5
Rib-eye area, in ²	2,072	14.56	1.40	9.62 to 21.64
Igenity Score				
Marbling	2,027	5.95	1.49	1 to 10
Rib-eye area	2,027	4.81	1.30	1 to 10
12 th - rib fat thickness	2,027	5.86	1.40	2 to 10
Hot carcass weight	2,027	5.79	1.46	1 to 10

Table 1. Summary statistics, closeout data, and Igenity carcass traits for all heifers.

¹ Grades: 1 = USDA Standard or lower; 2 = USDA Select; 3 = USDA Choice; 4 = USDA Prime

² Carcasses that graded USDA Standard or lower did not receive a USDA Yield grade

³ A total of 74 heifers' tissue samples failed and therefore have no Igenity results

There is a two-fold explanation for this occurrence. First, the distribution of Igenity scores was intentionally designed to be normally distributed. In other words, a majority of cattle tested should receive scores ranging from 4 to 7, followed by scores ranging from 2 to 3 or 8 to 9, and the smallest number, or extremes, receiving scores of a 1 or 10. This distribution is to help producers distinguish and select heifers who are exceptional or cull those less than ordinary. Investigation into the distribution of scores of these data prove this to be accurate. Because of this, the scores with the most variation shown in Figures 2b and 2d are those with lower numbers of heifers categorized, and therefore suffer from only having one or two animals to average. Another instance worth noting is the individual animal outlined in Figure 2b by the red box. Upon further inquiry of this outlier, it was determined that although the data point was representative of a single animal that received an Igenity score of 1 for HCW but a true weight of 967 lb, its breed composition included a larger portion of Brahman and Shorthorn which may have had an impact on accuracy of prediction.

Table 2. Summary of breed composition, as a percent, for all heifers.

Breed ¹	Percent Composition
Angus ²	64.00
Brahman	1.00
Gelbvieh	6.75
Hereford	10.75
Limousin	5.25
Shorthorn	3.50
Simmental	8.75

¹ Akaushi, Holstein, Jersey, Nelore and Wagyu breeds removed as they were consistently zero

Angus and Red Angus composition was combined

Figure 2. Relationship of Igenity Beef Scores with actual phenotype information for hot carcass weight (HCW) and marbling score (MARB) on 2,072 heifers either as an aggregate average or separated by lot.



(a) Relationship with HCW, on average

(c) Relationship with MARB, on average



(b) Relationship with HCW, by lot



(d) Relationship with MARB, by lot



Finally, all heifers were sorted based on their Igenity Terminal Index score, ranging from 1 (worst) to 10 (best). The top and bottom 25% (n = 507, each) of heifers were separated and their closeout data summarized. Based on this data, estimated revenue was calculated on a per head basis using grid information provided in **Table 3**. Differences in means were tested using a simple t-test, with these results summarized in **Table 4**. Overall, the top and bottom 25% of heifers differed by almost 2 Terminal Index scores, with an estimated revenue difference per heifer of \$101.10. That difference would equate to over \$51,250 for all 507 heifers.

CONCLUSION

Igenity Beef is designed to predict genetic potential in commercial crossbred cattle. It provides commercial producers with yet another tool to help improve their bottom line. Using only DNA, Igenity Beef can help predict future performance in many economically relevant traits. Heifers in this study were an admixture of breeds representative of the commercial industry and included in the training population for Igenity Beef. Results of this study support this product's ability to accurately differentiate performance in a feedlot environment. Specifically, variances in the Igenity Terminal Index resulted in over \$51,250 profit over 507 head of heifers. Overall, Igenity Beef is an effective product to help estimate genetic potential in commercial crossbred cattle.

Table 3. Grid premiums and discounts used to calculate revenue¹.

	USDA Yield Grade				
USDA Quality Grade	1	2	3	4	5
Prime	18.16	16.12	14.30	3.09	-3.49
Choice	3.86	1.82	BASE ³	-11.21	-17.79
Select	-18.37	-20.41	-22.23	-33.44	-40.02
Standard	-28.21	-30.25	-32.07	-43.28	-49.86
CARCASS WE	IGHTS		BASE ²	\$183	
400 – 500 lb	-31.43		900 – 1	000 lb	-1.00
500 – 550 lb	-24.13		1000 – 1050 lb		-8.00
550 – 600 lb	-11.80		Over 1050 lb -17.67		-17.67

^{1,2} Prices summarized from USDA National Weekly Direct Slaughter Cattle Report July 22, 2019

³ Premiums and discounts given \$/cwt

Table 4. Summary statistics and difference in revenue between the top and bottom 25% of heifers based on the Igenity Terminal Index.

Variable	Top 25% ¹	Bottom 25% ²	<i>P</i> value ³
Average Terminal Index	6.55 ± 0.02	4.58 ± 0.02	P<0.001
Rib-eye Area, in ²	15.12 ± 0.09	14.53 ± 0.07	P<0.001
Marbling Score	543.35 ± 5.49	523.60 ± 5.24	P=0.01
12 th - rib fat thickness, in	0.70 ± 0.01	0.71 ± 0.01	P=0.23
Hot carcass weight, lb	912.46 ± 3.54	865.02 ± 3.40	P<0.001
USDA Quality Grade⁴	3.05 ± 0.02	2.97 ± 0.02	P < 0.01
USDA Yield Grade⁵	2.99 ± 0.04	3.05 ± 0.04	P=0.34
Revenue, \$6	1647.20 ± 6.97	1546.01 ± 6.77	P<0.001
Difference per animal	\$101.10		

^{1,2} Top/bottom 507 heifers, based on Igenity Terminal Index Score

³ Calculated using a two-sided t-test, P < 0.05 considered significant

⁴ Grades: 1 = USDA Standard or lower; 2 = USDA Select; 3 = USDA Choice; 4 = USDA Prime

 $^{\scriptscriptstyle 5}$ $\,$ Carcasses that graded USDA Standard or lower did not receive a USDA Yield grade $\,$

⁶ Revenue calculated using the grid provided in Table 3

REFERENCES

Livestock, Poultry, and Grain Market News Division, St Joseph, MO. July 22, 2019



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