Does Administration of Anabolic Growth Implants to Finishing Beef Cattle Influence Carcass Attributes of Cattle Genetically Indexed for Enhanced Beef Palatability?

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Introduction

According to the 2005 National Beef Quality Audit, one of the Top "Greatest Quality Challenges" cited by packers and for which the industry has made the least improvement since 1991 is reduced grade and tenderness due to anabolic growth implants. The report also cited improved or changes in genetics as a top change requested from cow-calf producers, stockers/backgrounders, and feedlot operators. This study evaluated carcass differences between implanted and non-implanted cattle as well as determining whether genetic potential for palatability traits was overcome by implantation.

Procedures

Growth performance and carcass data were collected for 77 Angus-sired calves assigned to two treatment groups during the finishing period. Cattle were housed and fed at the Carrington Research Extension Center feedlot. Cattle in Treatment 1 (17 steers, 22 heifers) received an implant containing 100 mg trenbolone acetate and 14 mg estradiol benzoate (Synovex® Choice, Wyeth Animal Health, Madison, NJ) during the finishing period. Controls (19 steers, 19 heifers) received no implant at any time. Weights were recorded on arrival and every 42 days until harvest. Tissue samples were collected for commercial Igenity® (Merial Ltd., Duluth, GA) genetic profile indexing for carcass traits that included tenderness and percent USDA Choice. Cattle were fed to a common end weight of approximately 1100 lbs. and harvested on two dates at Tyson Foods (Dakota City, NE). The first group of 20 included ten head from each treatment which were harvested May 28, 2008. The second group of the remaining 57 head was harvested June 11. Carcass measurements were collected 24 hours postmortem. Longissimus samples were collected at the 12th rib to determine mechanical tenderness by Warner-Bratzler shear force (WBS) which was performed 16 days postmortem. Carcass data were analyzed using the GLM procedure of SAS (Version 8.0; SAS Inst. Inc., Cary, NC). Least squares means was used to determine treatment effect on WBS and marbling relative to genetic potential for tenderness, marbling, and percent choice, respectively. Igenity® results for cattle were sorted into low, medium, and high potential for each trait tested.

Calves from HREC, finished in the CREC feedlot; implanted and non-implanted.

Results
Results for carcass measurements and average daily gain are presented in Table 1.

Table 1. Effect of implant on ADG and carcass traits.

	Implant	No-Implant	St. Err	P
ADG (lbs./d)	3.589	3.13	0.057	<0.0001
Final Live Wt. (lbs.)	1171.85	1115.64	11.45	0.01
HC Wt. (lbs.)	693.96	655.75	7.41	0.009
REA (sq. in.)	11.63	11.47	0.146	0.60
12th Rib Fat (in.)	0.56	0.54	0.02	0.66
KPH%	1.92	2.03	0.05	0.30
Marbling*	408.56	426.24	12.126	0.47
YG	3.25	3.13	0.08	0.44
WBS (kg)	3.11	3.07	0.088	0.83

* Marbling scores: 200-299 = Slight; 300-399 = Small; 400-499 = Modest; 500-599 = Moderate.

Cattle were sorted into Low, Medium, and High Igenity® Index levels. Breakdown of numbers are presented in Table 2.

Table 2. Cattle sorted by Treatment and Igenity® Index Level.

		Implant	No Implant
Tenderness	Low	2	4
	Medium	20	20
	High	14	16
% Choice	Low	6	6
	Medium	25	26
	High	5	8

Average daily gain (3.59 vs. 3.13 lbs./d), final live weight (1172 vs. 1116 lbs.), and hot carcass weight (694 vs. 656 lbs.) were greater for the implanted cattle ($P < 0.05$). No differences ($P > 0.05$) were observed for ribeye area, fat thickness, KPH, yield grade, marbling, or WBS between treatments. Low, medium, and high Igenity® scores for percent Choice were significant ($P<0.05$) with marbling scores, indicating the genetic profile was valid for predicting marbling (Figure 3). Average marbling broken down by treatment and Igenity® level are presented in Figure 4. No differences ($P > 0.05$) were observed among cattle indexing high (Igenity® tenderness 8-10) between treatments (Figure 2). Numeric differences between Low and Medium Igenity® Tenderness levels can be partially explained by small group size (n=2 for Low/Implanted; n=4 for Low/Non-implanted).

Figure 1: WBS Force by IGENITY Tenderness Level

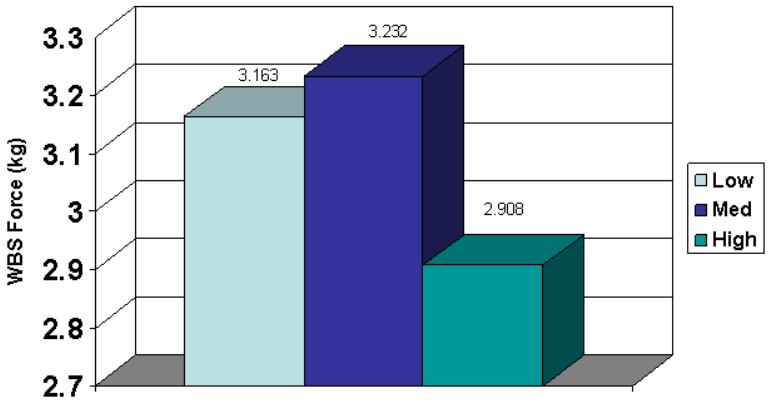
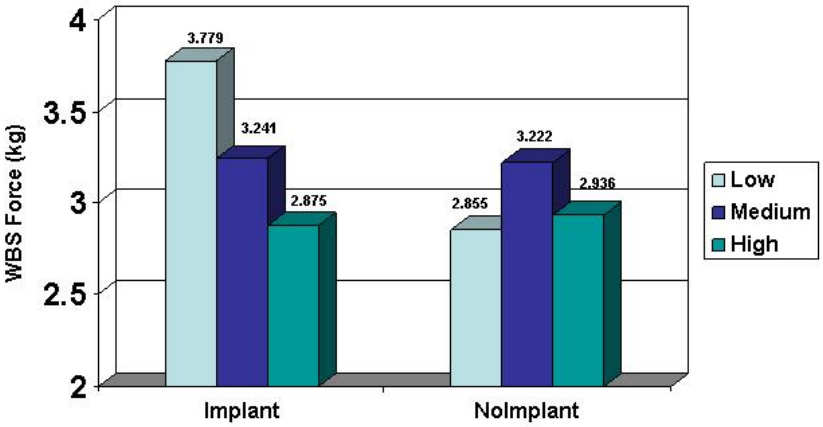


Figure 2: WBS Force by Treatment and IGENITY Tenderness Level



Cattle indexing high for percent choice had higher marbling scores than medium ($P < 0.01$) and low ($P < 0.05$) indexing cattle. Higher numeric marbling means for Low compared to Medium Igenity® percent Choice level may be due to fewer calves indexing in the low category (n=6 for both Low/Implanted and Low/Non-implanted compared to n=25 and 26 for Med./Implanted and Med./Non-implanted, respectively). The trends observed in this study suggest that anabolic implant use did not hinder genetic potential for tenderness, percent choice, or marbling.

Figure 3: Marbling Scores by IGENITY Percent Choice Level

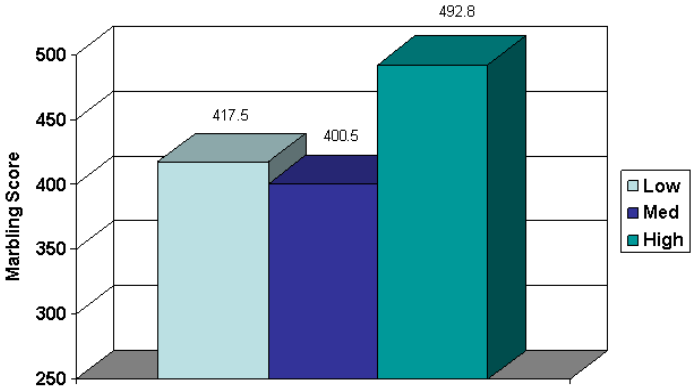
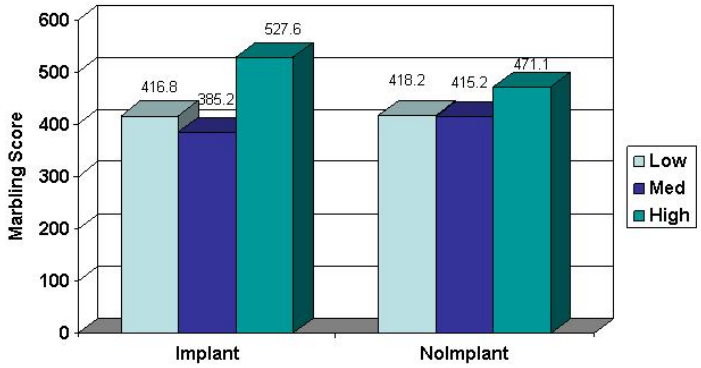


Figure 4: Marbling by Treatment and IGENITY Percent Choice Level



Discussion

Research into the effects of implant vs. no implant on feedlot performance and meat quality has been documented for years. In this study, we found differences only in ADG and final weights which carried into carcass weights. We found no differences in carcass measurements, possibly due to the fact that this study did not utilize a more aggressive implant regimen. More aggressive implant regimens have resulted in decreased marbling and tenderness (Platter et al., 2003). For an implant strategy similar to our study, the results from Platter et al. (2003) were similar to those above except that non-implanted controls had a higher percent Kidney/Pelvic/Heart fat.

Research evaluating how environmental factors, such as implantation, affect cattle of similar genetic background have typically been confined to using similar breeds or sires. Recent advances in genetic testing have allowed for commercial testing of livestock for economically relevant traits. Use of these genetic profiles to quantify the extent of environmental effect on an animal's genetic potential has not been previously reported. This presents an opportunity for groundbreaking work in combining the best management practices to fit an animal's genetic profile in order to maximize value for the producer.

References

Platter, W.J., J.D. Tatum, K.E. Belk, J.A. Scanga, and G.C. Smith. 2003. Effects of repetitive use of hormonal implants on beef carcass quality, tenderness, and consumer ratings of beef palatability. J. Anim. Sci. 81:984-986

Executive Summary of the 2005 National Beef Quality Audit. ◆