498

Development of fat depots in cattle and associations with beef quality

P Greenwood[1,2], J Siddell[1,2], M McPhee[1,2], B Walmsley[1,2], G Geesink[1,3], D Pethick[1,4]
[1]Australian Cooperative Research Centre for Beef Genetic Technologies, Armidale, NSW, Australia, [2]Industry & Investment NSW, Armidale, NSW, Australia, [3]University of New England, Armidale, NSW, Australia, [4]Murdoch University, Murdoch, WA, Australia
Email: paul.greenwood@industry.nsw.gov.au

Introduction Information on development of fat depots as affected by genotype, stage of production, nutrition during the immediate post-weaning period, and their interactions is limited. The objectives of this study are to 1) determine whether a high energy, starch based supplement during the immediate post-weaning period enhances marbling; 2) determine whether nutrition and genotype interact to affect development of fat depots; 3) obtain data and samples for detailed study of fat depot development; 4) understand factors influencing tenderness of beef and provide data for the Meat Standards Australia (MSA) cuts-based palatability model.

Materials and methods Steers (n=165) within three Genotypes were studied from weaning. Targeted genotypes were high intramuscular (IMF) and high subcutaneous (SCF) fat (Angus, A), low IMF and high SCF (Hereford, H) and high IMF and lower SCF (Wagyu x Angus, WA). From weaning, steers were fed pasture (P) or pasture plus high energy pellets (12.3 MJME/kgDM, 110g CP/kgDM) at 1% live weight (LW) (Supplemented, S) within 2 replicates per treatment for 168d. Steers were then backgrounded within 2 replicates until feedlot entry at 18 months of age. Steers were then short (100d) or long (250d) feedlot fed. Live weight did not differ due to nutritional treatment at any stage of the experiment. Base-line steers (n=15, Kill 1) were slaughtered at weaning, and groups slaughtered at the end of nutritional treatments (n=30, Kill 2), prior to feedlot entry (n=30, Kill 3), and after short (n=30, Kill 4) and long (n=60, Kill 5) feedlotting. Genotype, Kill and Post-weaning nutritional effects and interactions on carcass and chiller assessment traits and on IMF percentages were assessed by analyses of variance, with initial LW as a covariate due to Angus being heavier at the start of the experiment.

Results Hereford steers had more SCF at the P8 site and less marbling than the other Genotypes (Table). Carcass weight, SCF depths, marbling and IMF percentages increased with Kill number. Among the Genotypes, Wagyu-steers had the largest eye muscle area and highest ossification score and fat colour. Post-weaning supplement depressed Rib fat depth compared with forage feeding. No interactions were evident for the chiller assessment traits apart from a Genotype x Nutrition interaction for ossification score due to Herford cattle fed supplements having a lower score (127.4) than those fed pasture only (137.7). Interactions were evident for IMF percentages, and are being assessed as part of more complete analyses of the data.

Table 1 Effects ($P < 0.05$) on carcass chiller assessment traits and intramuscular fat percentages, adjusted for LW at start of the experiment (iLW). Within columns and effects, means with different superscripts differ significantly. Numbers of animals in parentheses are for intramuscular fat percentages

	Genotype			Kill					Post-weaning nutrition	
Variable	A	WA	H	1	2	3	4	5	P	S
Age (mo.)				6	12	18	21	26		
n	55(40)	55(40)	55(40)	15	30	30	30	60(30)	75(60)	75(60)
iLW (kg)	277^{b}	216^{a}	215^{a}	234	237	237	235	236	236	236
Carcass weight (kg)	337	331	327	117^{a}	188^{b}	267^{c}	381^{d}	457^{e}	354	349
P8 rump fat (mm)	13.2^{a}	14.3^{a}	17.7^{b}	1.4^{a}	4.2^{b}	7.3^{c}	19.1^{d}	25.5^{e}	17.0	15.9
Rib fat (mm)	9.1	9.8	10.2	1.3^{a}	3.0^{b}	5.2^{c}	13.1^{d}	15.4^{e}	11.1^{b}	9.9^{a}
Loin marble score	451^{b}	435^{b}	338^{a}	154^{a}	288^{b}	330^{b}	455^{c}	541^{d}	447	418
Intramuscular fat (%)										
Loin	7.26^{b}	7.04^{a}	4.76^{b}	1.96^{a}	2.57^{ab}	4.81^{b}	7.19^{c}	13.03^{d}	6.97	6.84
Oyster blade	10.17^{b}	10.55^{b}	6.19^{a}	3.25^{a}	4.36^{a}	6.79^{b}	11.03^{c}	16.71^{d}	9.30	10.13
Outside flat	6.08^{b}	7.51^{c}	5.43^{a}	2.11^{a}	3.21^{a}	5.37^{b}	6.69^{b}	12.20^{c}	6.77	6.97
Chuck tender	5.90^{b}	6.27^{b}	3.92^{a}	2.43^{a}	2.93^{a}	5.25^{b}	6.43^{c}	8.31^{d}	5.89	5.57
Eye round	4.27	4.45	4.03	2.02^{a}	2.46^{a}	3.94^{b}	4.45^{b}	7.27^{c}	4.47	4.60
Eye muscle area (cm^2)	73.0^{ab}	77.0^{b}	70.3^{a}	37.6^{a}	51.3^{b}	65.2^{c}	83.9^{d}	91.6^{a}	78.1	75.8
Ossification score	131.5^{ab}	136.5^{b}	130.2^{a}	106.8^{a}	110.6^{a}	123.9^{b}	135.7^{c}	152.4^{d}	136.1	134.4
Fat colour score	0.57^{a}	0.90^{b}	0.74^{ab}	1.94^{e}	1.00^{c}	1.53^{d}	0.53^{b}	0.03^{a}	0.67	0.57
Ultimate pH	5.55	5.57	5.58	5.59	5.60	5.53	5.56	5.57	5.57	5.56

Conclusions and further research The post-weaning supplement did not enhance marbling, and had a somewhat suppressive effect on SC fat. The genotypes had predicted marbling characteristics, although SC fat did not differ overall between A and WA. Data is currently being generated from CT-scans and depot weights obtained at slaughter to quantify amounts of total body and carcass fat and of all major fat depots. Phenotypic data presented in the Table above, and data for the weights of fat depots and consumer assessments of eating quality currently being generated, will be used to inform detailed studies of fat depot development and meat quality. The data will also be used to refine the MSA model.