Effects of protected nutrients on fatty acid composition in feedlot cattle

J.J. Davis[1], R. Tume[2], P. Allingham[3] and G. Harper[3]

Cattle and Beef Quality Cooperative Research Centre
[1] Agriculture Victoria, Rutherglen Vic 3685
[2] Food Science Australia, Tingalpa Qld 4173
[3] CSIRO Livestock Industries, Indooroopilly Qld 4068 jenny.davis@nre.vic.gov.au

The amount and fatty acid composition of lipids significantly affects quality of any feedstuff. In beef, fatty acid composition affects shelf life, palatability, and nutritive value.

An earlier study at the AV–Rutherglen Research Feedlot showed that a dietary supplement of nutrients protected from degradation in the rumen (Marble Plus^{TM}; a combination of starch, protein and lipid) in a feedlot ration increased both visual (marble score) and chemically measured intramuscular fat (IMF) of Murray Grey steers. Cattle fed Marble Plus^{TM} had higher proportions of C18 (di– and tri–) unsaturated fatty acids (C18:2; C18:3) than did control cattle and this led to a decrease in the melting point (mp) of the subcutaneous fat to below 25^{o}C.

In the current study 60 F1 Wagyu and 60 Angus steers were fed a control or protected nutrient (Marble Plus^{TM}) ration for 159 to 179 days. The performance and carcase data and the fatty acid compositions of the subcutaneous fat are shown in the Table 1.

Marbling in control and treated steers was similar, suggesting either that nutrients were less protected in the later than in the earlier study, or that other factors outside the experimental design contributed this outcome. Genetic differences between animals in potential to marble could certainly contribute to differential response to treatment. The F1 Wagyu steers had higher (P<0.05) levels of marbling than did the Angus steers. There were also significant differences in the relative proportions of 14:0, 16:1, 18:0 and 18:2 fatty acids between the breeds: F1 Wagyu had lower proportions of C18:0 and higher proportions of mono–unsaturates (C16:1; C18:1) suggesting different activity of the Δ^9–desaturase enzyme compared with Angus. The observation that cattle fed Marble Plus^{TM} had higher proportions of C18 (di– and tri–) unsaturated fatty acids (C18:2; C18:3) than the control cattle, suggests that the fatty acids in the ration were indeed protected from rumen degradation and hence appeared in the subcutaneous fat.

Table 1 Growth and fat deposition by steers given supplementary nutrients protected from ruminal degradation.

	Control	Treated	SED	*P*	Angus	Wagyu	SED	*P*
Initial LW, kg	452	454	5.0	0.901	425	481	4.5	<0.001
ADG, kg/d	1.11	1.18	0.04	0.074	1.24	1.04	0.04	<0.001
HSCW, kg	362	367	3.9	0.254	360	369	3.9	0.014
P8 fat,mm	20	21	1.2	0.318	19	21	1.1	0.117
DP%	55.5	55.4	0.29	0.833	55.4	55.5	0.24	0.491
IMF%	10.08	10.96	0.61	0.197	9.74	11.30	0.61	0.011
Marble score	2.61	2.78	0.14	0.239	2.55	2.84	0.12	0.017
14:0[a]	2.85	2.89	0.12	0.841	2.73	3.00	0.11	0.014
16:0	26.08	25.14	0.44	0.023	25.25	25.97	0.38	0.058
16:1	4.01	3.60	0.24	0.047	3.35	4.26	0.24	<0.001
18:0	11.10	11.35	0.67	0.570	12.15	10.30	0.67	0.006
18:1	47.95	47.91	0.59	0.979	48.09	47.76	0.59	0.578
18:2	1.37	2.75	0.07	<0.001	2.18	1.93	0.07	<0.001
18:3	0.31	0.71	0.02	<0.001	0.52	0.50	0.02	0.346
MP, ^{o}C	36.6	34.5	1.7	0.426	38.1	33.9	1.7	0.013

[a] Fatty acids are reported as percentages of total fatty acids