POLYUNSATURATED FATTY ACIDS FROM PASTURE VERSUS SOYA BEANS FOR INCREASING CONJUGATED LINOLEIC ACID (CLA) IN BEEF FAT

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Increasing the polyunsaturated fatty acid (PUFA) content, and particularly the conjugated linoleic acid (CLA) content, of beef fat is considered desirable from the viewpoint of consumer acceptance. Livestock feeds rich in PUFA include fresh, immature pasture and oilseeds. However the relationship between PUFA in the diet and in the animal product is influenced by biohydrogenation and isomerization in the rumen (Griinari *et al*. 2000). The response in CLA concentration to PUFA supplementation of the diet is generally less in beef fat than milk fat. The predominant CLA isomer (*cis*-9, *trans*-11 18:2) in beef tissue is thought to be mostly derived from ruminal isomerization of *cis*-9, *cis*-12 18:2 (linoleic acid). In dairy cows it is now clear that a large proportion of CLA originates from desaturation of *trans*-11 18:1 (vaccenic acid) in the mammary gland (Griinari *et al*. 2000).

The objective of this research was to determine the relationship between PUFA intake from either pasture, grain or an oilseed and CLA concentration in animal tissue. Twenty four steers were assigned to one of three pasture-based treatments (2 reps/treatment); pasture alone (PAS), pasture plus 4.5 kg DM/day rolled barley (PAS+BAR) or pasture plus 1.8 kg DM/day whole roasted soya beans (PAS+SB). After 108 days cattle were slaughtered, carcase characteristics determined and fat samples representative of sub-cutaneous, intermuscular and intramuscular sources were taken. Throughout the trial intake and liveweight (LW) were monitored.

Table 1. Diet composition and intake of selected polyunsaturated fatty acids

	Concentration in the diet (mg/g DM)			Intake (g/day)		
	Pasture	**Barley**	**Soya beans**	**PAS**	**PAS+BAR**	**PAS+SB**
18:2 Linoleic acid	101	555	533	22.8	80.1	216
18:3 Linolenic acid	723	56.7	72.9	163	141	187

In pasture the predominant PUFA was 18:3 whereas in barley and soya beans it was 18:2 (Table 1). Thus, supplemented cattle consumed more 18:2 than unsupplemented cattle (Table 1). Unexpectedly, the intake of 18:2 and CLA concentration of fat were unrelated (Figure 1) but there was a clear relationship between intake of 18:3 and CLA concentration (Figure 2), even though CLA is not an intermediate in the biohydrogenation of 18:3.

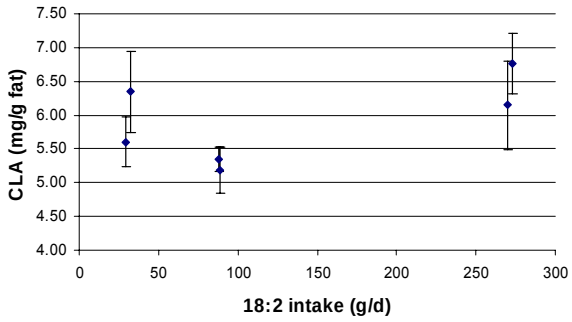

Figure 1. Relationship between 18:2 intake and CLA

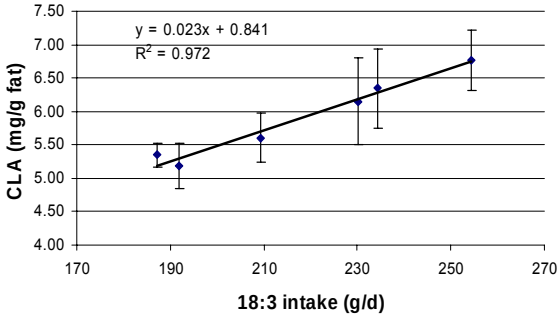

Figure 2. Relationship between 18:3 intake and CLA

We therefore conclude that under these conditions the dominant pathway for CLA synthesis involved partial biohydrogenation of 18:3 (linolenic acid) in the rumen to *trans*-11 18:1 (vaccenic acid). Subsequently, in the tissues vaccenic acid was desaturated to *cis*-9, *trans*-11 CLA by Δ-9 desaturase (Mardon et al.2002). These results support the theory that Δ-9 desaturase activity may be important in the formation of CLA in beef tissues as well as in milk.

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