

Effects of dietary fat and conjugated linoleic acid on metabolic responses to homeostatic signals in pigs

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One constraint facing the pig industry is that *ad libitum* feeding can often result in high levels of body fat. Dietary conjugated linoleic acid (CLA) has been shown to decrease fat deposition and body fat content of pigs (Dunshea and Ostrowska 1999) but the mode of action is unknown. Fatty acids for lipogenesis are derived from either circulating triglycerides of largely dietary origin or can be produced *de novo*, principally from glucose. The aim of this study was to investigate the effects of dietary CLA and fat on responses to the major regulators of lipid metabolism, insulin and epinephrine.

Twenty female cross bred (Large White x Landrace) pigs (65 kg) with venous catheters were fed for eight days either a low fat diet (25 g fat/kg) or a high fat diet (100 g/kg) with either 0 or 10 g/kg of CLA–55. Pigs were offered approximately 90% of *ad libitum* DE intake and feed was delivered every 3 h to ensure a relatively steady state for measuring plasma metabolites. Plasma glucose and non-esterified fatty acid (NEFA) responses to insulin (3 µg/kg) and epinephrine (3 µg/kg) were determined on day 8.

Plasma NEFA and triglycerides were increased by high fat and CLA feeding whereas plasma glucose was unchanged (Dunshea and Ostrowska 1999). The plasma NEFA response to epinephrine was increased suggesting increased lipolysis with CLA feeding. The plasma glucose response to epinephrine was reduced by high fat feeding and tended to be reduced by dietary CLA. While the anti-lipolytic effect of insulin was reduced in pigs fed CLA there was no effect of CLA on plasma glucose response to insulin. These data suggest that the responses to homeostatic signals during CLA feeding favour increased lipolysis rather than decreased *de novo* fat synthesis in adipose tissue.

Dunshea, F.R and Ostrowska, E. (1999). Conjugated linoleic acid—snake oil or wonder fat. *Recent Advances in Animal Nutrition in Australia* **12**, 159–166.

Dunshea, F.R. (1993). Effect of metabolism modifiers on lipid metabolism in the pig. *Journal of Animal Science* **71**, 1966–1977.

Table 1 Effect of dietary fat and CLA on basal metabolite concentrations and responses to insulin and epinephrine.

Fat, g/kg (F):	25		100		Significance		
	0	10	0	10	F	C	FxC
CLA–55, g/kg (C):							
Response to epinephrine							
Plasma NEFA (µmol.min/L) ¹	88	260	135	243	0.78	0.018	0.55
Plasma glucose (mmol.min/L) ²	81	67	53	39	0.007	0.12	0.98
Response to insulin							
Plasma NEFA (µmol.min/L) ¹	–49	40	–43	32	0.98	0.036	0.84
Plasma glucose (mmol.min/L) ²	–81	–76	–73	–80	0.84	0.86	0.43

¹Sum of response over first 6 min.

²Sum of response over first 30 min.