The effect of supplementation with conjugated linoleic acid on the reproductive performance of lactating dairy cows

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Introduction Trans-10, cis-12 conjugated linoleic acid (CLA) is a potent inhibitor of milk fat synthesis (Baumgard *et al*., 2002). Feeding supplemental CLA may be a means of ameliorating negative energy balance (NEB) post partum, potentially improving subsequent reproductive performance. A recent meta-analysis of 5 controlled studies where CLA had been supplemented to early-lactation dairy cows indicated that CLA supplementation significantly reduced interval to first ovulation and time to conception, and increased the probability of cows becoming pregnant (de Veth *et al*., 2009). The aim of the present study was to examine the effects of CLA supplementation on milk production and reproductive performance of lactating dairy cows in a field scale situation.

Materials and methods 389 spring calving pasture-based dairy cows on a single commercial dairy farm were enrolled on the trial and randomly assigned to one of two dietary treatments (CLA (n=192) or Control (n=197)). The two treatments were balanced for parity and calving date. The cows were milked twice daily in a 60-unit rotary parlour with automatic cow identification, automatic feeding, and electronic milk meters (Dairymaster, Kerry, Ireland). All cows were fed an equal amount of concentrate ration in the parlour. The CLA cows received an additional 50g/day of a lipid supplement (Lutrell, BASF, Germany) from parturition until 60 days in milk. The CLA supplement contained a 50:50 mix of cis-9, trans-11 CLA and trans-10, cis-12 CLA, resulting in a daily intake of 5 g per day of each isomer which was automatically dispensed using a PowerDos® feeding system (Hanskamp AgroTech BV, Zelhem, The Netherlands). Milk samples were collected 3 mornings per week, and each sample was analysed for progesterone using a competitive ELISA test, in order to determine interval to first ovulation. Milk yield and composition were measured fortnightly. Trans-rectal ultrasonography was carried out prior to mating start date to ascertain utero-ovarian status. Heat detection was carried out with the aid of MooMonitor® activity collars (Dairymaster, Kerry, Ireland) and tail paint. Trans-rectal ultrasonography was carried out at 30-36 days and 60-66 days post AI to determine conception rate and embryo loss. Milk yield, milk composition, and interval to first ovulation data were analysed using mixed model analysis. All other reproductive data was analysed using the Chi-squared test.

Results Milk yield and composition data are summarized in Table 1. A significant reduction in milk fat concentration and yield was observed in CLA treatment cows during the supplementation period. Milk protein concentration was also reduced. Milk yield was increased by CLA supplementation, although milk solids yield was not affected. Reproductive performance data are summarized in Table 2. There was no effect of CLA on interval to first ovulation, 6-week submission rate, conception rate to first service, embryo loss after first service or 6-week in-calf rate.

Table 1 Effect of CLA supplementation on milk production and composition

	Control	CLA	S.E.M	P-value
Milk yield (kg/day)	24.7	27.2	0.70	0.003
Milk fat (g/kg)	36.9	30.7	0.60	<0.001
Milk protein (g/kg)	32.8	31.2	0.30	<0.001
Milk fat yield (kg/day)	0.91	0.84	0.02	0.031
Milk protein yield (kg/day)	0.81	0.85	0.02	0.11
Milk solids yield (kg/day)	1.72	1.69	0.05	0.60

Table 2 Effect of CLA supplementation on reproductive performance

	Control	CLA	P-value
Interval to first ovulation (days)	40.2	44.4	0.12
3-week submission rate (%)	54.8	58.0	0.50
Conception rate to first service (%)	35.1	37.0	0.70
Embryo loss to first service (%)	14.3	21.4	0.30
6-week In-calf rate (%)	43.6	37.0	0.20

Conclusions Supplementing dairy cows with CLA reduced milk fat synthesis. Contrary to previous reports, milk protein concentration was also reduced. However, reproductive performance was not improved by CLA supplementation. As reproductive performance was generally poor in this study, it may be that energy status was not the limiting factor and there may have been other problems influencing herd fertility.

References

Baumgard, L. H., E. Matitashvili, *et al*. 2002. Journal of Dairy Science 85(9), 2155-2163
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