

The Effect of Feeding Calcium Soaps of Fatty Acids on the Reproductive Physiology of Lactating Dairy Cows

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Introduction Although it is not a substantial constituent of dairy cattle feed, there has been much work on the effects of feeding supplemental fat on reproductive performance. Supplemental fat increases the energy concentration of the diet and may lessen the effects of the negative energy balance post calving. Adding fat has been reported to positively influence reproduction in a number of ways, for instance increasing plasma progesterone concentration and increasing the life span of the corpus luteum (for a review Staples *et al.*, 1998). A number of studies have demonstrated the importance of progesterone in early pregnancy and in particular the timing and strength of the post ovulatory progesterone rise. The aim of this study was to establish the effect of a dietary supplement of fat, in the form of calcium soaps of fatty acids, on reproductive function and in particular on post ovulatory progesterone levels in lactating dairy cows.

Materials and methods Thirty multiparous Holstein-Friesian cows from the University of Nottingham's commercial dairy herd calving October to December 1999, were assigned to one of three groups, which were balanced according to time post partum (46 ± 4 days $\mu \pm se$). A control group (n=10) received a total mixed ration containing grass silage, maize silage, brewers grains, bread dough, barley mineral mix and cereal soya. In addition two further groups were fed supplemental fat (calcium soaps of fatty acids, Megalac®, Volac Ltd.) at either 750g/cow/day (high group, n=10) or 375g/cow/day (low group, n=10). Throughout the thirteen-week trial period twice-weekly milk samples were collected to monitor normality of reproductive cycles (p.m., Monday and Friday). Samples were also collected on days 4, 5 and 6 following 1st AI (day of AI=day 0). Milk was assayed for progesterone by ELISA (Ridgeway Scientific). Progesterone profiles were used to define cycle problems (delayed onset of cyclicity – progesterone < 5ng/ml until > 65 days post partum; cessation of cyclicity – progesterone < 5ng/ml for > 2 weeks following a period of > 5 ng/ml; luteal cysts – progesterone > 5ng/ml for > 3 weeks). Body weight and condition score were recorded weekly for the first four weeks and then fortnightly during the remaining trial period. A blood sample was taken on day 5 following 1st AI for progesterone radioimmunoassay. On three consecutive days mid-trial feed intake was recorded on a group basis. All data were analysed by two-way analysis of variance using Genstat 5 (Lawes Agricultural Trust, 1997).

Results Fat supplementation did not affect energy balance, with results for body condition score and weight change showing little difference between groups. The high group did, however suffer greater (P<0.05) weight loss for a short period (15d) at the beginning of the trial compared with the control animals. Feed consumption was not significantly different among the groups. In terms of reproductive responses a similar lack of variation between groups was observed. No effect was observed in conception rate to 1st service or with problem cycles. Post ovulatory plasma progesterone concentrations (d5) showed a tendency to increase with fat supplementation, however differences were not significant and did not continue further into the cycle.

Table 1 Comparison of parameters in the three treatment groups.

	Feed Intake (kg/cow/day) ($\mu \pm se$)	Day 5 Plasma Progesterone (ng/ml) ($\mu \pm se$)	Day 5 Milk Progesterone (ng/ml) ($\mu \pm se$)	Milk Yield (l/day) ($\mu \pm se$)	Cows with Normal Cycles	Cows Conceived to 1 st AI
High	58.9 \pm 2.5	1.9 \pm 0.3 (n=10)	4.4 \pm 0.7 (n=10)	41.0 \pm 1.1 (n=10)	5 (n=10)	4 (n=10)
Low	54.3 \pm 2.1	1.6 \pm 0.4 (n=7)	4.3 \pm 0.7 (n=7)	38.7 \pm 2.0 (n=10)	6 (n=10)	2 (n=10)
Control	57.7 \pm 2.0	1.2 \pm 0.2 (n=7)	4.2 \pm 0.4 (n=6)	37.2 \pm 2.5 (n=10)	6 (n=10)	4 (n=10)
Significance	NS	NS	NS	NS	NS	NS

Conclusion In conclusion, the current results show that a dietary supplement of calcium soaps of fatty acids did not affect either milk or plasma progesterone. Furthermore no variation was seen in conception rate or cycle abnormalities. The energy balance of the animals measured through body condition score and weight change, also showed no major effects of fat supplementation.

Acknowledgements This work was supported by MAFF and the Megalac® was supplied by Volac Ltd. L.M. Hicking was funded by a studentship from Dartington Cattle Breeding Trust.

References

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