

Manipulation of bovine milk composition through supplementation with a protected cottonseed meal

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The strategic use of dietary lipid protected from ruminal degradation provides two mechanisms through which animal productivity may be altered. Firstly the proportion of unsaturated fatty acids in the lipid component of tissues can be increased, and secondly the sensitivity of tissues to signalling molecules which alter gene expression in target tissues can be manipulated. This study investigated the effect of supplementation with formaldehyde-treated cottonseed which has a high linoleic acid content (C18:2), on milk composition and was made in association with studies of reproductive function in Holstein-Friesian cows (Della-Vedova *et al.* 1999).

Multiparous Friesian cows lactating for 60–140 days were assigned to one of three groups (n = 10) to match their stage of lactation and offered 10 kg DM of a concentrate ration balanced for energy and nitrogen content containing either 0, 1 or 2 kg of PCM in addition to ryegrass/kikuyu *ad libitum*. Cows were milked twice daily and integrated milk samples (1% of production) were collected daily from the a.m. milking commencing 5 days prior to the provision of the supplement, for the subsequent 14 days, and thereafter weekly. Milk was analysed for fat and protein content and fatty acid composition.

Milk yield was not altered by treatment and averaged 24.3 ± 1.5 , 23.9 ± 1.2 and 23.9 ± 1.9 kg per day (mean \pm SEM) for the 0, 1 and 2 kg groups respectively. Similarly average milk fat yield and concentration were not affected by treatment (fat yield: 780.4 ± 77.2 , 785.3 ± 57.5 and 823.8 ± 77.2 g/d for 0, 1 and 2 kg groups respectively). Fatty acid composition was altered markedly by the provision of the supplement, with dose-dependent decreases in C14:0, C16:0 and C18:1c9 fatty acids, a three to five-fold increase in C18:2, and a 50% increase in C18:0 (Figure 1). The increase in C18:2 persisted for the duration of the treatment period (Figure 2). Milk protein percentage was not altered by treatment.

The formaldehyde treatment of cottonseed facilitated the transfer of linoleic acid (C18:2) to the mammary gland which altered the balance of other fatty

acids in milk without altering total fat content. It did not, however, affect the activity of the lipogenic and protein biosynthetic hormones in mammary tissue since milk fat and protein concentrations and yield were unchanged. The wide variation in fat and protein content reported in many studies in response to protected lipid supplements, may be related to the nature of the protection process.

Della-Vedova, J.J., Simos, G.C., Myung, K.H., Fleck, E., Gooden, J.M. and Wynn, P.C. (1999). The influence of protected cottonseed meal supplementation of a concentrate/pasture diet on the secretion of progesterone (P4) in bovine milk. *Recent Advances in Animal Nutrition in Australia* **12**, 20A.

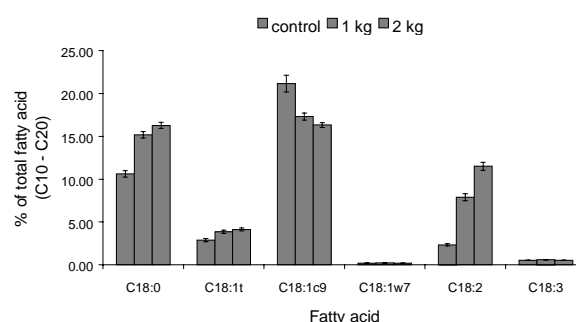


Figure 1 C18 fatty acid profile after 4 weeks of supplementation.

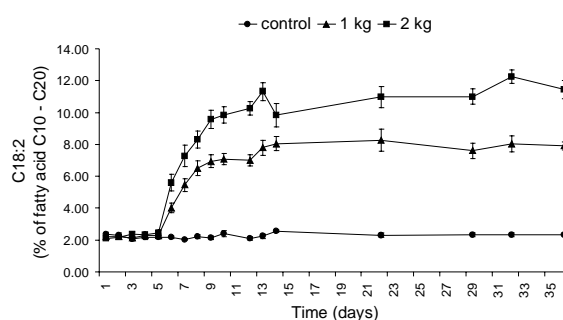


Figure 2 Change in percent of C18:2 over time.