PROTECTED D,L-METHIONINE INCREASES MILK YIELD IN DAIRY COWS ON A HIGH INTAKE OF GRASS SILAGE

O. E. Sem and W. Velle

Norwegian College of Veterinary Medicine, Oslo, Norway

Introduction

Under certain conditions methionine is a limiting amino acid in animal production. Protected methionine as feed supplement for dairy cows has given variable results, probably due to differences in management and feed composition, but many trials have resulted in higher milk yield (Kaufmann and Lüpping, 1982; Illg et al., 1987). Grass silage is low in methionine (Thomas et al., 1980). Since grass silage is the major source of forage for dairy cows in Norway, a field trial was carried out to study the effect of a preparation of protected methionine on milk yield under practical conditions.

Materials and Methods

The trial was carried out on 33 controlled herds, comprising a total of about 500 high-yielding cows of the Norwegian Red Breed. The animals were fed according to Norwegian feeding standards, with grass silage consituting 34%, hay 6%, ammonia-treated straw 4%, concentrate mixtures 42%, and pasture 13% on a net energy basis. Using the milk records for the previous year, the herds were divided in a control group (I) and an experimental group (II) with nearly identical means. The changes in milk yield from the control year (year 1) to the experimental year (year 2) were recorded and compared for the two group of animals. Methionine was given in the form of Ketionine®, (Peter Møller A/S, Oslo, Norway), small pellets containing 30% (w/w) of D,L-methionine in a matrix consisting mainly of a mixture of long-chain fatty acids. In the experimental year the animals in the control group received pellets of the same lipid composition, but without methionine. The pellets were mixed with the concentrates and given in a daily amount of 50 g, corresponding to 15 g D,L-methionine, for 100 days, starting two weeks before anticipated parturition. The farmers were not informed about which type of preparation contained methionine. Milk records covered the entire lactation period for all animals, and yields in FC milk were compared.

Results

The mean individual milk production for the control year and the experimental year in the two groups of herds are given in table 1. The mean individual increase in the production of FC milk from year 1 to year 2 was 83 kg in the control group, and 226 kg in the experimental group. The increase in yield in the experimental group year 2 was significantly higher than the previous year, and also when compared to the yield of the control group in year 2.

TABLE 1. EFFECT OF PROTECTED METHIONINE (PM) ON YIELD OF F.C. MILK IN FIELD EXPERIMENTS ON DAIRY COWS

Groups of animals	Year 1		Year 2		No. of herds deviating year 2 v 1
	No. of animals	Yield (kg)	No. of animals	Yield (kg)	
Group I					7 (+)
14 herds	204	6.338[a]	199	6.421[a]	1 (0)
No PM					5 (-)
Group II					15 (+)
19 herds	294	6.331[a]	284	6.557[b]	
PM year 2					4 (-)

Dosage of PM: See text.
a,b: $p < 0.05$

Discussion

When the mean individual yields for each herd were compared, differences in yield between year 1 and year 2 were observed in both groups of animals. As shown in the table, the numbers of herds with increased and decreased yield in year 2 were

almost equal in the control group, while in the experimental group 15 of the 19 herds given the methionine supplement showed increased yields. In a field trial of this type, considerable variations in response had to be expected.

Ketionine does not offer complete protection of methionine against degradation in the rumen. Experiments indicate that 20-30% of the amino acid is released in the rumen, and that 50-60% is absorbed in the intestine (Kaufmann and Lüpping, 1982, and unpublished reports).

The positive response to Ketionine may be due to two main events. The release of small amounts of methionine in the rumen stimulates microbial protein production (Arambel et al., 1982, unpublished), thereby increasing the intestinal protein supply. However, the major factor is probably the increase in the intestinal supply of free methionine, due to rumen bypass of the amino acid.

Some rumen bypass may also be obtained when methionine is given in unprotected form. Giving 15 g unprotected D,L-methionine intraruminally to sheep, bypass of 28.4% was found by Cottle and Velle (1989). When doses of 50 g were given intraruminally to cows, 31% bypassed the rumen (Sulu et al., 1989). Assuming a bypass percentage of 30 independent of dose, 15 g unprotected methionine would result in the bypass of 4.5 g. This is considerably less than the 50-60% (7.5-9 g) absorbed in the intestine following administration of 15 g protected methionine. However, the percentage rumen bypass of amino acids given in unprotected form decreases with decreasing dose level (Cottle and Vells, 1989; Sulu et al., 1989). Cost-benefit calculations will decide whether and/or in which form limiting amino acids should be given as feed supplement.

(Key Words: Methionine, Cow, Milk Yield)

Literature Cited

Cottle, D. and W. Velle. 1989. Degradation and outflow of amino acids from the rumen in sheep. Brit. J. Nutr. 61:397-408.

Illg, D.J., J.L. Sommerfeldt and D.J. Schingoethe. 1987. Lactation and systemic responses to the supplementation of protected methionine in soybean meal diets. J. Dairy Sci. 70:620-629.

Kaufmann, W. and W. Lüpping. 1982. Protected proteins and protected amino acids for ruminants. pp.36-75 in Protein contribution of feedstuffs for ruminants: Application to feed formulation (L. Miller, I.H. Pike, A.J. H.van Es, eds.). London. Butterworth.

Sulu, N., K. Bjørnstad, D. Grønset and W. Velle. 1989. Ruminal degradation and outflow of amino acids in cows. J. Vet. Med. A. 36: In press.

Thomas, P.C., D.G. Chamberlain, N.C. Kelly and M.K. Wait. 1980. The nutritive value of silages. Digestion of nitrogenous constituents in sheep receiving diets of grass silage and grass silage and barley. Brit. J. Nutr. 43:469-479.